MARCH

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

PROPERTY OF DENTAL SCHOOL DON'T REMOVE

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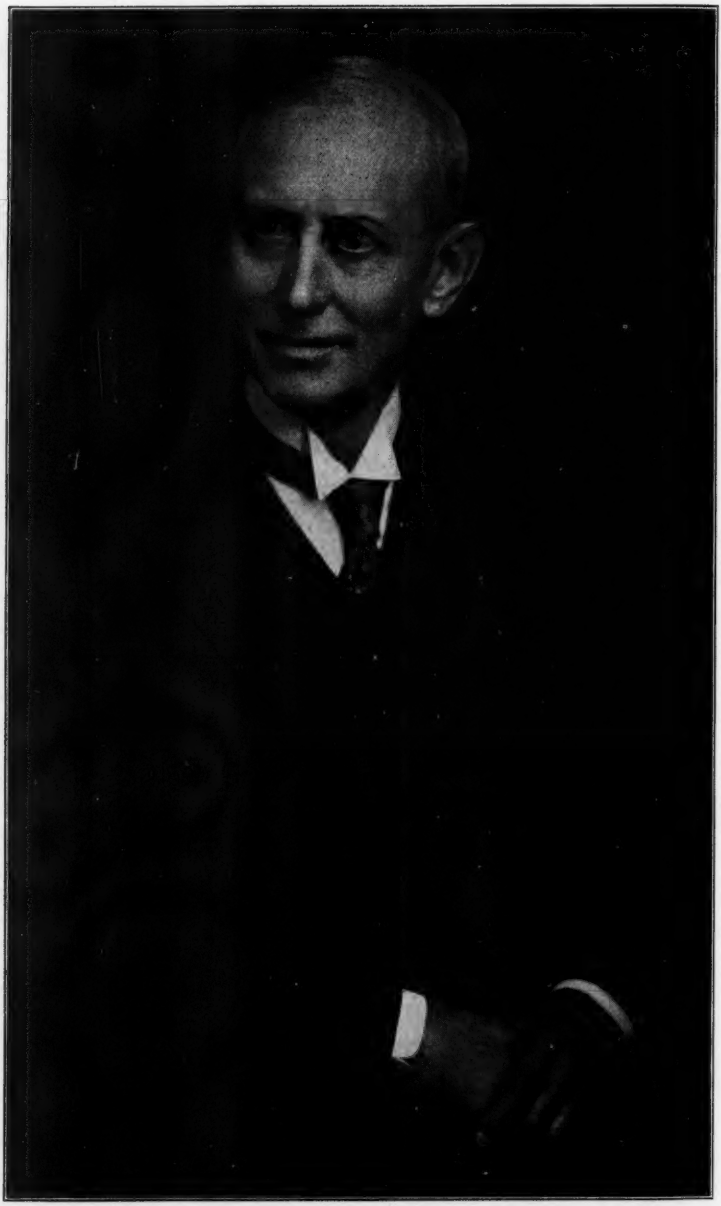

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Original Communications

PROFESSIONALLY OWNED OFFICE BUILDINGS

By GUY S. MILLBERRY, D.D.S., San Francisco, California

THERE must have been some motive that has prompted professional men during the last decade to undertake the promotion and erection of office buildings. The investment feature may have appealed to some, but there must have been other motives, and I am convinced that the incentives were rent control and exclusive occupancy.

Rents, like all other purchasable commodities, fluctuate with the law of supply and demand. Owners, and leasing landlords who control office buildings, market their floor space at the highest possible price, and where a demand exists and leases do not interfere, it is not uncommon to raise rents at frequent intervals during a year. Owners have also learned that long term leases on property which is in the line of progress in a city in which values may change quickly and assessments are likely to be correspondingly high are undesirable, even hazardous, for costs of operation and maintenance may exceed income, and the annual reports thus show a deficit.

The community apartment, developing in New York, followed by community acreage home tracts, and later by office buildings on the same general plan, probably furnishes a precedent for the interest aroused, although the community ownership idea does not generally prevail in the so-called professionally owned office buildings, to my knowledge. The latter have taken the cooperation idea from the community ownership plan and have used the corporation plan for promotion and management. The plan of promotion has been variable. In many instances, the project has been started by members of a profession and later has been taken over by investment bankers or promoters, the professional men, as a rule, being

left to pay the bills. In rare instances, the project has been carried through to completion by those who were the originators of the idea.

PROMOTION

Generally speaking, physicians and dentists have had little experience in promoting business enterprises. They usually furnish the money for somebody else to do so. The success of any enterprise, especially a stock corporation, is largely dependent on the promoter, even though its ultimate success is dependent on the nature of the business and its management.

Professional promoters (I mean those who make the promotion of any kind of activity their business) are not always interested in the future success of that activity, for their commission on a large enterprise is sufficiently generous to carry them for awhile, and new fields are always open. It therefore behooves any group that desires to undertake such a project to study all phases of it basically. I have found that a good general understanding can be obtained from such books as "Financing an Enterprise," by Conyngton, and "Corporation Procedure," by Conyngton, Bennett and Pinkerton, published by Ronald and Company.

As to the enterprise itself, professional office buildings in desirable localities, if well managed, pay good dividends and are therefore a good investment. There are several outstanding reasons why they are good investments if desirable sites are chosen and good buildings are erected. First, the members of the medical and the dental professions are a good class of tenants. They invariably pay their rent. If it costs more to maintain an office building for them than for other tenants, the excess cost should be reflected in the rent. They bring a good type of clientele to their building, which adds to its value and to the value of the business in the immediate vicinity, and this, in turn, is reflected in increased property values and a corresponding increase in the value of the stock.

While physicians and dentists are frequently looked on as poor business men, it will usually be found, on inquiry at the banks, that they pay their notes when due, and their defaults are, as a rule, less numerous than those in other professions or lines of business.

The advisability of selecting a professional promoter to carry a professionally owned office building enterprise through is an open question. It may be advisable to employ a good stock salesman on salary or commission, or both, for a brief period of time, to arouse interest and establish contacts, but the promoter usually will not guarantee to complete his job, and he insists on his full quota while the project is being developed. If he does not succeed, the stigma of his failure is hard to overcome.

Another fact should not be lost sight of, and that is that the capitalization expenditures do not stop at the promoter's desk, but extend all around it, and if from 20 to 25 per cent is allowed for promotion expense, other capitalization costs must also be provided for, which reduce the actual number of cents in each dollar produced by the sale of stock or bonds for building purposes.

The promoter's commission, the architect's and contractor's fees, the bond discount, the insurance, office expenses and many other items are not to be found in steel and brick and stone, and the higher the cost of the building,

plus capitalization and promotion expense, the higher the rents must be if a fair dividend is to be assured.

ORGANIZATION

The first essential in organization is the selection of a reliable board of directors, whose faith in the project is unswerving and whose ability and professional standing is unquestioned. The second essential is to build a strong cooperative spirit among the stockholders so that the "doubting Thomases" will find no weak spots by means of which they may derogate or undermine the project for personal reasons.

The board should be unanimous in its decisions when votes are taken. Factional issues or minority reports should not appear as matters of record, even though differences of opinion may prevail at times. It is advisable to retain the same board by reelection annually, at least during the period of promotion, construction and preliminary occupancy, because of their full knowledge of the project.

The selection of an attorney demands careful thought, for not only the legal status but also the financial status of the enterprise may depend on his counsel and advice. He should rank in his profession as the board ranks in theirs, for his standing in the community is an important asset.

The selection of an office force, beginning possibly with a stenographic-secretarial assistant to the secretary, who has had some bookkeeping and bank experience, and gradually developing until the full quota from stenographer to building manager is reached, is but a question of experience and good judgment. Personality is a prerequisite in the selection of such a force because of the type of people to be dealt with.

FINANCING

The financing of the project is usually referred to a bank or trust company, though some brokers, under the new designation of investment bankers, often provide funds or a means of obtaining them. Occasionally, a syndicate of representatives of all of these will arrange for the purchase of a bond issue and suggest a method of minor financing.

Three factors present themselves; the major financing, usually a bond issue, or a bank or private loan; the minor financing, usually a stock subscription, or a second mortgage loan; and a reserve, or provision to take up the slack. It is difficult for an organization to foresee just what problems may arise before the final acceptance of the building, so that, while all possible emergencies may be anticipated up to the limit of securities, provision for a reserve should be made. It may be that among the stockholders or the directors themselves a final request for funds may be met in case of extreme emergency to avoid the placement of liens or a foreclosure.

The "legal for savings banks" requirement demanded in some states before the bank commissioner will give his approval on a bond issue necessitates a fair appraisal of the land and a review of the estimated costs submitted by the architect. The organization desiring to buy the bonds is often in a position to secure better results in this matter than the corporation is; hence, further cooperation is desirable.

In floating the bond issue, the discount is the important factor. One of the largest organizations in the United States always demands ten points so that but 90 cents on the dollar is available to begin with. Further costs

may be added unless the corporation is particular in specifying that everything incident to the floating of the bond issue, including title insurance, printing, revenue stamps, all legal expenses, etc., except the corporation attorney's fee, is written into the agreement.

If the project is sound, and backed by responsible people, the bond houses and banks will be anxious to buy the bonds. It then remains for the corporation to obtain the best terms possible. Trust companies, banks and bond syndicates frequently make more money by buying bonds than by selling them, with less expenditure of effort and greater safety. This constitutes the major financing, and, the terms and the discount will determine whether the minor financing will be easy or difficult to carry out. If the bond issue is sold at a moderate or reasonable discount, and if it is sold before the building is completed, it will probably be discounted slightly below par value by the buyer. Generally, if the project is sound, large blocks of bonds are provisionally sold by agreement before the purchase of the bonds is concluded. Bond issues rarely exceed 60 per cent of the appraised values.

Minor financing covers approximately the other 40 per cent of costs unprovided for, and is handled, in some professional office buildings, by one person or a few individuals. If it is a straight corporation problem, the sale of stock is the best but not the easiest method. When stock sales are not sufficiently rapid to provide the required balance of 40 per cent, arrangements can be made by the corporation to borrow on stock subscriptions made on the partial payment plan if they are secured by notes. Such notes collected at the bank and secured by a second mortgage are considered reasonably good collateral, and while banks may not be willing to make loans on them, subsidiary trust companies or financial organizations within the affiliation will do so.

It is well to make tentative but not obligatory provisions for minor financing with the major financiers, for stock sales may reach such proportions during the process of construction that the need for such a loan will be obviated.

Another practical plan is to make use of the credit of the stockholders themselves, and pay them for it. It is to be their building and they have money invested in it; they are interested. Most of the stockholders own other stocks or bonds which are held in a safe deposit box as an investment. They generally have a market value. If a group of them will agree to loan their securities as collateral for the minor financing of the project, they may have a legal agreement drawn stating the terms and conditions of the minor loan, which in this instance is protected by a note from the corporation and a second mortgage, and they proceed to serve as bankers in their own interests.

From among their number, they elect three or four trustees who act for them, borrowing money from the bank at a more reasonable rate of interest, lending it to the corporation at a higher rate, and thus reaping the profits of their own project.

The corporation will probably be unable to borrow money on a second mortgage at less than 7 per cent. It can meet part of its interest charges by charging all stock subscribers the same rate on deferred payments. If the corporation is unable to sell enough stock to complete its minor financing and is obliged to pay 7 per cent to a bank or trust company, it is better to favor its stockholders by paying them the higher

rate of interest, under the plan just mentioned. Banks will lend money on good collateral for 6 per cent or less. If the stockholders loan their credit or collateral, through their selected trustees, to the corporation, the latter should be willing to pay them the higher rate of interest equal to the bank demands on the second mortgage. There is less danger of foreclosure under such conditions. The dividends on stockholders' securities held in trust naturally revert to them and, by arrangement, can be collected as they fall due.

OTHER INCOME

This factor of other income might seem to be inconsequential, yet revenue from interest on deposits in banks, on deferred payment subscriptions, on sinking fund and prepayment accounts, when the total sum runs into hundreds of thousands of dollars, is very important, and it is therefore advisable to make prior arrangements for the best rate. This also holds true with regard to trust funds. Occasionally, property having improvements yields an income which, pending removal or destruction prior to building, will pay taxes and a low rate of interest on the investment.

Every source of income should be made to yield in order to reduce the ultimate cost of the project, a distinct value to every stockholder.

THE BUILDING

The greatest interest centers around the building. Therefore, the selection of an architect capable of designing a building that is beautiful yet possessed of great utilitarian value, at a minimum or moderate cost of maintenance, requires good judgment. No easy task confronts the board of directors in this selection, for every stockholder has a friend who has a friend that is an architect, and contacts through any director's acquaintance are usually at hand.

The architect's judgment should guide the board after the preliminary plans and specifications are submitted and accepted, and nothing is more to be desired than harmony between them. The same holds true of the builder or contractor, and herein lies the question of good business. Building under a flat contract or on a guaranteed cost with a commission guaranteed depends on the selection of the builder. If he is a man of integrity, and one whose experience justifies every confidence, the latter plan is better, even though he may do part of the construction work with his own crews.

The directors have the assurance, under such a plan, that the building will not exceed a certain cost, barring extras subsequently authorized, and they know that if any savings are effected, they will profit thereby; while the total cost is guaranteed and, if necessary, can be protected by a bond.

Not infrequently, architects or builders will accept a portion of their fees in stock. This not only reduces the amount of money to be raised in minor financing but also insures a personal interest in the design, construction and operation of the building.

It is unusual to extend the cooperative spirit, through the sale of stock, to the subcontractors, the realtors or the insurance brokers, but since the plan is cooperative, the advantage of such cooperation is reflected in a further reduction of costs to the corporation, by the savings that revert to it which might otherwise be lost sometime during the period of financing and construction.

The corporation must expect to pay for all such services. It can well afford

Medico-Dental Building, San Francisco, California

to pay its own stockholders such costs when, by including them as stockholders, special advantages revert to the corporation, none being greater than lowered costs of design and maintenance and higher revenues from others who are not directly concerned in the project as stockholders.

So many elements of the building enter into the primary cost of construction and the permanent cost of maintenance that advice from many reliable sources should be obtained.

The engineering problems of a modern office building are complex. Not only the structural design, the materials and other civil engineering problems, but the mechanical engineering as well demands thought. Transportation is the first element of importance; therefore, an adequate elevator service, including ample sized cars, noiseless operation, speed without its terrors, safety control, freight facilities, emergency service and costs of maintenance must be carefully thought out. The operation of this service is closely related to all these factors, and they become a building manager's problem. If the engineering features are inadequate or inappropriate, he can never make a success of the elevator system.

Heat, light and power are standard essentials. An economic primary installation of a steam heating plant, with a partial vacuum return system attached, reduces the required steam pressure to one and one-half or two pounds in the Medico-Dental Building in San Francisco (1,878,428 cubic feet capacity), and the cost of fuel oil has never exceeded $6.25 a day.

Electric service in this type of modern office building is exacting. While alternating current is universally used, direct current must be supplied; hence, in some offices, double circuits must be installed. Separate conduits for roentgen-ray service connecting directly with the power company's service through meters are necessary to prevent fluctuation in current and to place the responsibility in case of dissatisfaction.

All buzzers and annunciators should be placed on a separate circuit, complete in itself and obtaining current from the main switch board through transformers, which reduce it to a low tension current. This obviates the use of dry batteries throughout the building.

Telephone outlets should be located when the office suites are planned so that no unsightly wires or conduits are exposed. Screwed baseboards, with a channel back of them, will permit subsequent installation without defacement if necessary.

Lighting and electric power are utilities difficult to control, for every tenant and employe is habitually careless about wastage in such matters. The ease with which an electric light is turned on; the lack of knowledge of the cost of the current; the normal belief that one is entitled to all the current he wishes to use just because it is included in the rent, are responsible for this wastage, so the uncontrolled losses must be made up in effective savings, where the tenant does not suffer by such means.

Adequate water pressure, as necessary on the top floor as in the basement, both for fire protection and for tenant use, can be maintained by tanks in the attic, and an auxiliary pumping plant to keep them filled from city mains and to sustain the pressure on the upper floors is necessary. This must be duplicated for emergency. The installation of chilled water equipment, with its pumps all automatically controlled, a water softener system, and a hot water system

utilizing the combustion heat units from the garbage incinerator, supplemented, when necessary, by an oil burner, are some of the problems incident to that common necessity, water.

Compressed air pumps for office and laboratory service at one pressure, and for the garage at another pressure, with filters to remove dust, dirt, oil and water are units every building of this nature must have, and, further, these apparatus must be of the type that will not resound throughout the entire building by transmission through metal pipes or steel frames. A short length of rubber tubing capable of withstanding the pressure is all that is required. No modern building is safe, as far as utilities go, unless most of this machinery is duplicated, so that a double installation is necessary in nearly every instance, especially in pumping machinery.

The ventilation of all interior rooms and lavatories demands a complete modern installation with adequate control, for nothing is more unpleasant than noxious vapors or odors in a building occupied by physicians and dentists.

Electrically operated machinery of the individual unit type, generally by direct shaft connection, is the most economical. Forty-three motors ranging from one-fourth to 35 horsepower are used in the Medico-Dental Building.

SUITE PLANS

The most perplexing problems are the laying out of office suites, and the question of extras. Individual tastes, in a reasonably large group of stockholder-tenants, if the privilege of designing one's own office is granted during the process of construction, bring a multitude of difficult problems whose solution demands the greatest tact and patience.

On the other hand, few professional men can read an architect's plans understandingly, and mechanical plans are as the dead languages to all. An expectant stockholder-tenant presents his ideas in a rough sketch; perhaps a modification of his present office arrangement. These are worked out to scale by a draftsman or young architect, who confers with him as to corrections in detail.

They appear satisfactory and are approved, and when laid out on the floor of the building or when roughed in, they are too small or poorly arranged, doors are hung the wrong way, space is inadequate for new furniture ordered, the telephone is in the wrong place because the desk had to be moved, and electrical outlets are insufficient. Many perplexing difficulties are encountered before the work is complete. Every change in plans submitted to the workmen necessitates a complete change in all the sets of plans for that floor, one of which must be delivered to each contractor, subcontractor and the corporation before that particular unit can be constructed.

Delays in getting a final acceptance from the stockholder-tenant result in delays in the building construction, adding to the costs which either the tenant or the corporation, usually the latter, must pay. It is a physical impossibility to complete the arrangements and plans for all of the suites, under such a scheme, at a given time in order to obtain bids on the completed project, since the building in process of construction carries with it the element of success, and many will not subscribe until it is under way.

A stockholder-tenant, noticing a washstand located near the standpipes with only a short run of vents, waste

and supply, decides to have it changed to another position in the room. The proposed change may place it directly over a girder, necessitating moving a partition to accommodate him and encroaching on his neighbor, who protests and makes trouble. To him, it is only a washstand, yet the change may involve the expenditure of hundreds of dollars in modern building construction, under existing building laws, and he protests the exorbitant charge for extras.

Submitting a standard type of floor plan for a medical or dental office with the customary utility outlets and conveniences should carry with it explicit and positive statements that any modification of, subtraction from or addition to the plan will probably result in extras, the cost of which can only be estimated, and when dozens of changes are made daily, such cost information cannot be obtained readily. Delays again add to the trouble and cost of construction.

A better method for the corporation, if it can be made acceptable to the stockholder-tenants, is to submit a loft plan showing utility outlets, etc., and then offer to provide the sites as per individual arrangement, the stockholder to be permitted to go as far as he cares to, and to pay his own bills.

Estimates can be provided on the standard type of office plan, which will allow a credit of a certain sum per square foot. This is more equitable, because a certain proportion of the cost is borne by all stockholders; whereas, the loft plan requires the tenant to furnish all the basic costs of that which immediately becomes the property of the corporation.

Agreements as to the payment of the costs, including interest on deferred or delayed payments, of all extras asked for by the stockholder-tenant, should be entered into at the time his plans are approved and before construction begins. Otherwise, the corporation has to finance all extras, which may endanger the success of the enterprise.

GARAGE

Perhaps no more perplexing traffic problem presents itself than that of parking space. The convenience of the automobile is fast being reduced to a minimum by parking regulations or a lack of facilities. No business or profession needs automobile service or suitable parking facilities more than does the medical profession; hence, every effort should be made to provide them.

Since this convenience is of particular value to this professional group, it should be managed in their interest. They should receive first consideration. Leasing the garage deprives the corporation of control, both as to rates and service, and if a garage can be operated profitably by a business man of mediocre experience, certainly a capable building manager, with a reliable, experienced garage superintendent, the latter operating on a salary and bonus basis, can do as well, and should do better. We have proved this fact satisfactorily.

Such a garage can be a semipublic one, to be used by transients, evenings and holidays, especially if it is in the vicinity of theaters or popular hotels. By utilizing the employes' labor steadily, a better service can be given the regular tenants in spite of a higher rental, and greater saving to them can be effected than by means of lower rentals with poorer service. Daily care prevents the need of frequent washings, and the oil, gasoline and water problems are looked after without loss of the owner's time. The service can be extended as far as the corporation desires. Com-

pressed air service for tires, vacuum service for cleaning cars, and the use of soft water for washing cars can be obtained from the building plant at a low cost.

LUNCHROOM OR CAFE

A lunchroom is a hazard. It may be a nuisance, or an asset, this depending on the arrangement and the management. Barring transportation, the roof or attic is the most desirable place because of the odors. Transportation of food supplies and waste must be limited to early morning hours. Control should be exercised by the corporation over the quality of the food and the care of the place, for this utility should command a clientele as fine as the tenantry of the building. The lunchroom serves as a meeting place during meal hours and provides special meals for the dinner meetings that are so common to professional groups. The corporation may lease with definite control or may, under good management, operate this concession as a part of its business. Experience commands the former procedure. It is not so essential to the needs of professional tenants as the garage, and hence need not become a part of the corporation's business activity.

Ground floor stores should be leased for short terms (from three to five years) to: reliable tenants whose type of business is attractive and high class, and to nonstockholders, on a graduated scale of rentals which permits of such increases as the business will bear.

The advantage of having high class, reliable tenants leasing on a graduated scale of rentals is obvious. It is equally obvious that, as stockholders, they would have access to the corporation's records, and thus might combat any proper increase in the rentals or limitations as to occupancy which are wholly justified. On the other hand, the corporation has no access to their business records, and hence cannot determine whether their requests, demands or protests are just or not.

MANAGEMENT

The board of directors must determine all policies, fiscal, executive, building, etc. The executive work can be delegated to an executive or building committee composed of tenants of the building. The building manager, who is the executive officer, should have the personal responsibility of employing and discharging all employes, and should also have general supervision of all accounting, banking, purchasing, leasing and other matters of routine. Such persons are not easily found, for a medicodental building presents problems differing markedly from those of general office buildings. A man who has had experience as a hospital director, superintendent or manager, with accounting and banking experience, is usually the most valuable type because of his training.

The influence of friendship between tenants and members of the board is at times difficult to combat. It can only be wisely controlled by the selection of directors whose first and only thought is the welfare of the corporation as a whole.

Auditing and accounting are easily worked out after the building is accepted, but during building operations are a complicated problem, especially if parts of the building are occupied prior to completion.

Dividends on investments, of course, can be paid only out of the profits, and these depend on good management.

The lower the cost of the building and the better the design as far as annual maintenance is concerned, the better the results will be financially, both as to incremental value in stock and increase in dividends. The stock should not be listed, for the only protection the stockholder-tenants have is the control of a majority of the stock. As soon as it passes from their control the original motive, rent control and exclusive occupancy, is again before them for solution.

Professionally owned office buildings offer permanency of tenure and special advantages as to facilities, environment, associations and rent control, and, if well managed from the inception, are a desirable investment as well as an asset to any community.

MORPHOLOGY OF THE MICRO-ORGANISMS OF THE ORAL FLORA*

By THEODORE B. V. BEUST, Louisville, Kentucky

ABOUT forty-five years ago, W. D. Miller[1] classified many of the micro-organisms habitually found in the mouth. As the majority of the forms that constitute the materia alba cannot be induced to grow on artificial mediums, classification was necessarily based on morphology alone. The same obstacle, owing to our inability to culture these organisms, confronts us at the present time. It is true that reports of the cultivation of a few members of this group have been published,[2] but the identification of the cultured forms with those found in the mouth has not yet, for reasons about to be presented, been sufficiently established.

A few years after the publication of Miller's work, F. Vicentini, of Chieti, Italy, published his researches on *Leptothrix racemosa*.[3] Although Mummery,[4] Goadby,[5] Watson[6] and Williams[7] cor-

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*This work is supported, in part, by a grant from the Research Commission of the American Dental Association.

*Read before the Section on Bacteriology, Pathology and Diagnosis at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 23, 1926.

roborated a part of Vicentini's work, his ideas on the pleomorphism of the mouth organisms have met with criticism and have never gained general recognition. Vicentini, it will be remembered, claimed that the greater number (or all) of the commensals peculiar to the film found on the teeth were developmental phases of a single organism. Satisfactory substantiation of his claim would nullify Miller's classification.

In view of the increasing interest shown the fusiform and thread forming organisms of the mouth, which are also evident in pulmonic lesions, a careful study of the problem seems warranted. In approaching this matter, it appeared desirable to revert to some of the older conceptions. We will, therefore, first consider the peculiar clumps of tooth slime ordinarily appearing when, for the purpose of making a smear, it is teased apart on the slide. These clumps, which consist of fragments of the film of organisms on the teeth, were commonly looked on as accidental conglomerations of micrococci and tangled threads. About the middle of the past century, Robin, and later Leber and Rottenstein,[8] called such masses the matrix, from which *Leptothrix buccalis* sprouted. As this term appears singularly appropriate, it should be revived,

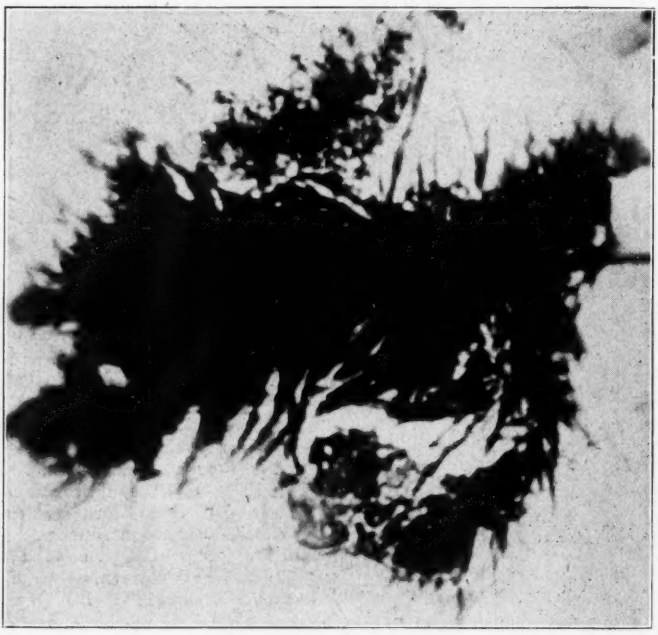

Fig. 1.—Matrix (not differentiated).

8. Leber and Rottenstein: Caries der Zaehne, Berlin, 1867.

Fig. 2.—Matrix (partly differentiated).

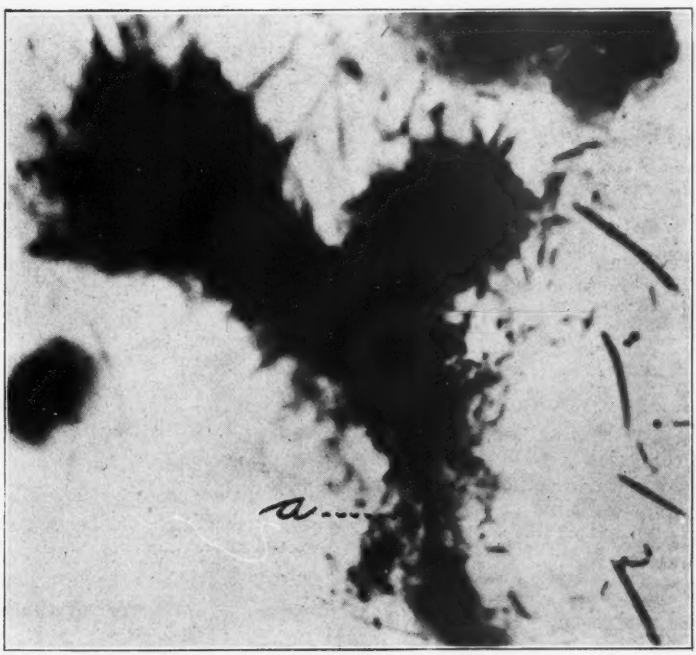

Fig. 3.—Matrix (partly differentiated, showing stem).

for a matrix to many forms actually exists.

The matrix (Fig. 1), when stained by ordinary laboratory methods, seldom permits of a differentiation of its contents. Being imbedded in tooth slime (glia or glair—Vicentini), which also takes a stain, the elements composing the mass are hidden. Between 1906 and 1911, while working on the morphology of these organisms, I succeeded, by means of various reagents, in clarifying some of these clumps. Reports on that investigation[9] have been published.

The matrix, anatomically, usually consists of an elongated body (Fig. 2), with a central thread or axis. The axis is covered with variously shaped bodies, or spores. This illustration is more completely differentiated than the foregoing one. The proper degree of differentiation is not easy to attain. Moreover, photographing them presents considerable difficulty as the elements do not lie in one focal plane and, in addition, the light will not penetrate the denser portions sufficiently. Demonstration of the axis is not at all difficult. Figure *3a* shows a portion of the central thread denuded of a part of its covering. This central thread appears, as shown in some of the figures,

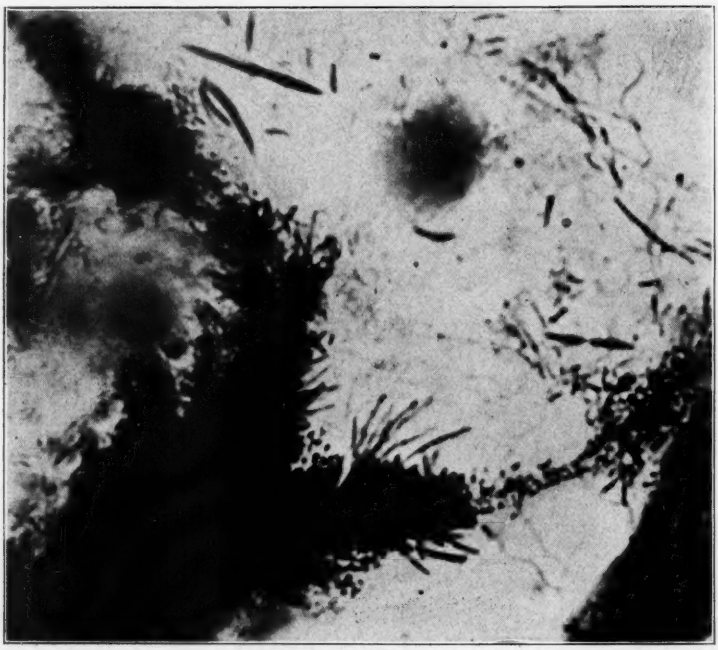

Fig. 4.—Matrix (differentiated, showing stem).

9. V. Beust, T. B.: Arch. f. Zahnheilk., 1906, No. 3; Dent. Cosmos, 50: 594 (June) 1908; Proc. Fifth Internat. Cong., Berlin, 1909; Int. Items, 31: 99 (Feb.) 1909; Dent. Rev. 26: 117 (Feb.) 1912.

Fig. 5.—Leptothrix racemosa of Vicentini. (4 mm., oc. 8.)

to have undergone a branching. This appearance, I think, is an accidental manifestation, as I have never yet observed branching of the thread forms of the mouth.

Figure 4 gives us the impression of one that has branched. This illustration also shows the stem or axis well.

Figure 5 is a habitus view of *Leptothrix racemosa* of Vicentini. This photograph was taken with the 4 mm. lens. With but two exceptions, all other micrographs were taken with an oil-immersion objective.

Figure 6 shows a magnification of a few individuals of the same group. This organism usually occurs in graceful clusters. Spore bodies are distributed uniformly around the central thread. These specimens were stained with iron-hematoxylin.

By staining with ammoniated silver nitrate, the stems of these organisms are often brought to view (Fig. 7).

Fig. 6.—Leptothrix racemosa. (2 mm., oc. 8.)

Fig. 7.—Leptothrix racemosa, stained with ammoniated silver nitrate.

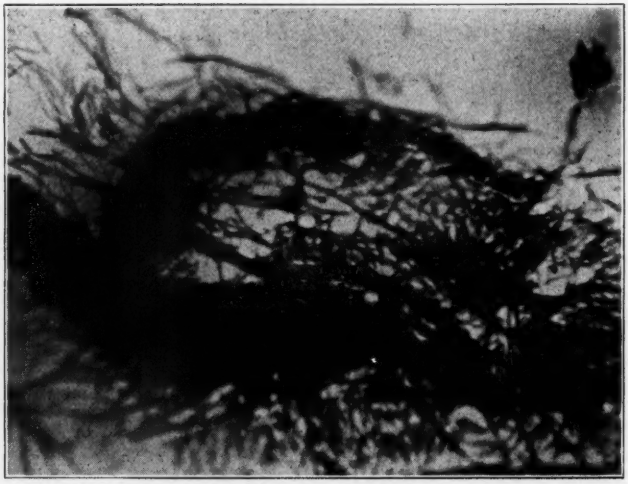

Fig. 8.—Matrix, showing stem or axis.

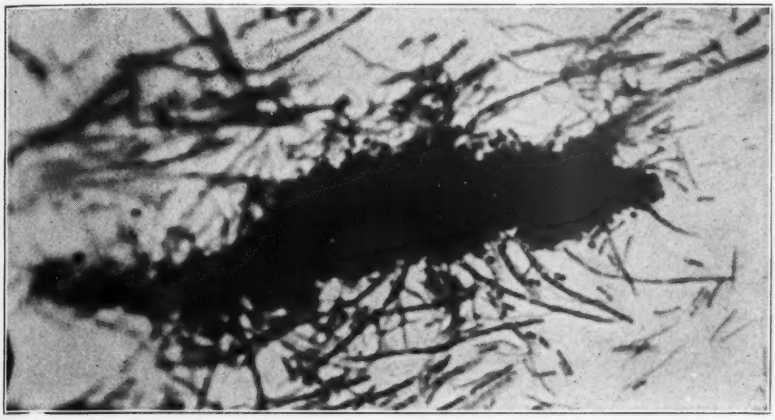

Fig. 9.—Matrix, a common type.

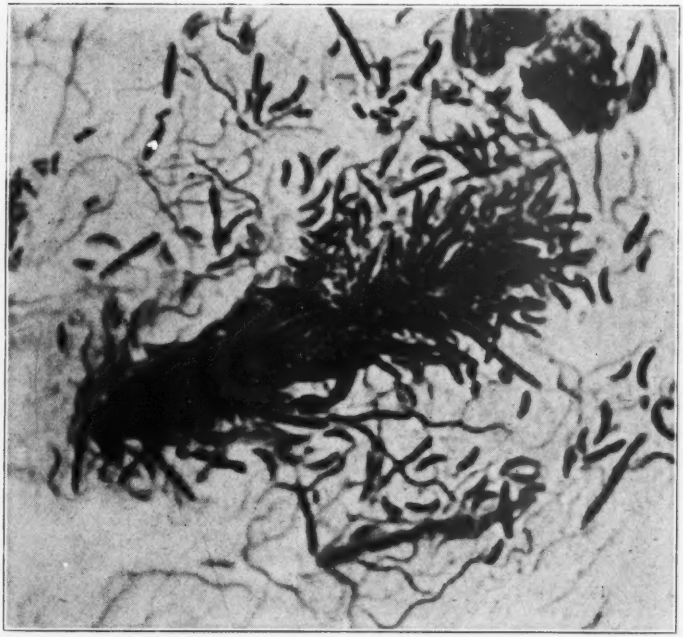

Fig. 10.—Matrix, showing axis and peripheral bodies. (2 mm., apochromatic.)

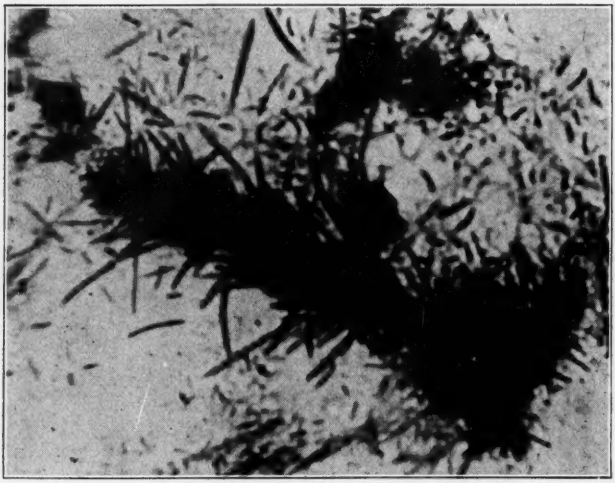

Fig. 11.—Matrix. (1-12 hom. immersion, oc. 8.)

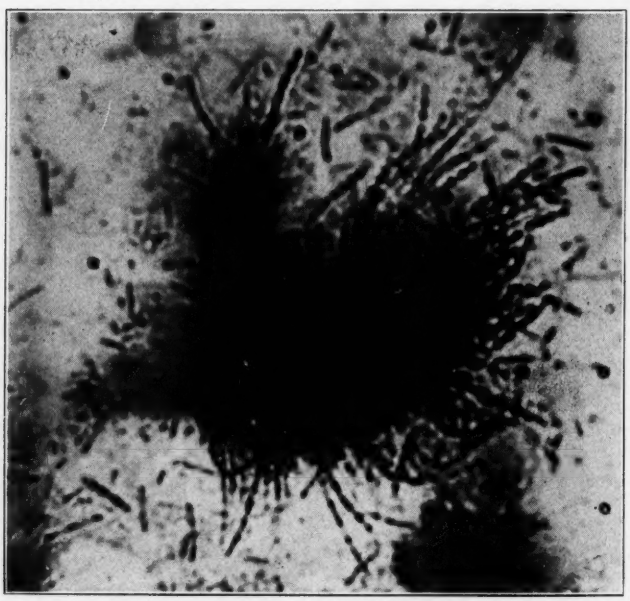

Fig. 12.—Matrix. (4 mm., oc. 8.)

Fig. 13.—Matrix, showing falcate conidia.

Fig. 14.—Matrix, a specimen resembling that shown in Figure 13.

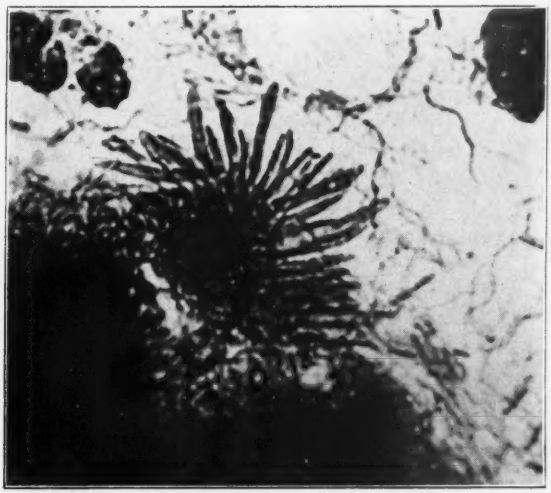

Fig. 15.—Matrix; a fragment displaying fusiform conidia.

This is also a specimen of *Leptothrix racemosa.*

Figure 8 is a form frequently met with. The exposed continuation of the axis may be noted. The uncovered part resembles *Leptothrix racemosa.* The masses covering the axes consist of more or less rounded spores.

Figure 9 shows another matrix. The rounded spores are here evident also and thread forms appear to be growing from the mass.

Figure 10 is a specimen which shows the central axis well and also introduces us to the peculiarities in form exhibited by the peripheral bodies. All views of the matrix here exhibited were stained with carbolfuchsin and differentiated with 2 per cent sulphuric acid.

Figure 11 is another example which resembles the foregoing. The study of countless specimens of this kind must awaken the conviction that these masses are organic units.

Figure 12 represents one of the views taken with the 4 mm. lens. The peripheral threads are more elongated than in the foregoing. The beading here seen is frequently observed.

It is not yet possible to determine whether the peripheral bodies surrounding the axis should more appropriately be called spores, conidia or gonidia, or gametes. Vicentini speaks of sexual elements, but, thus far, I have found no indication of copulation or zygote formation. I am unacquainted with Vicentini's exact views on the matter, as I have been unable to consult his original text. For the sake of simplicity, I will call these bodies conidia.

Are the conidia, which also undoubtedly appear as dissociated bacterial elements in smears, really developmental

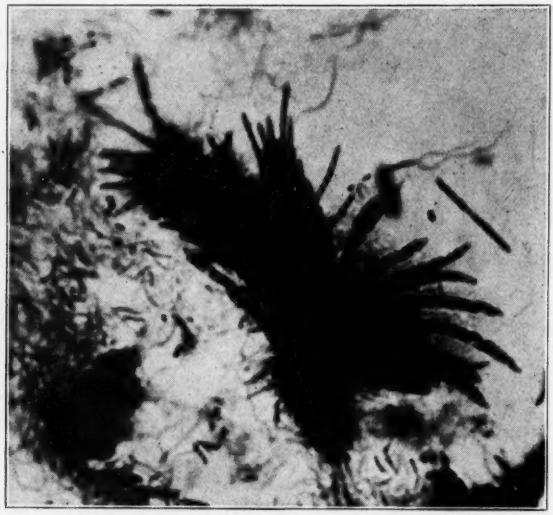

Fig. 16.—Matrix, with conidia approaching the thread form.

stages of the threads? Complete substantiation would profoundly modify modern views concerning the classification of many forms. It would signify the exclusion of many of the cocci, the spirilla, the fusiform organisms and probably many more now known as bacteria, from the eubacteria or true schizomycetes. This question can and should be definitely settled. We should, in view of the fact that this matter has been before the profession about thirty years, come to some decision. Is the matrix an organic unit or is it not? If it is, then why are modern bacteriologists ignorant of its existence? If it is not a unit, how can we account for the revelations of this series of unretouched photographs? We can safely predict that morphologic studies of the conidia, with the help of improved technic and more and better photographs, will demonstrate the transition of the conidia into the parent form. Notable work has already been done by the authors above cited, but verification and general recognition is wanting.

Fig. 17.—Matrix, with comma like conidia.

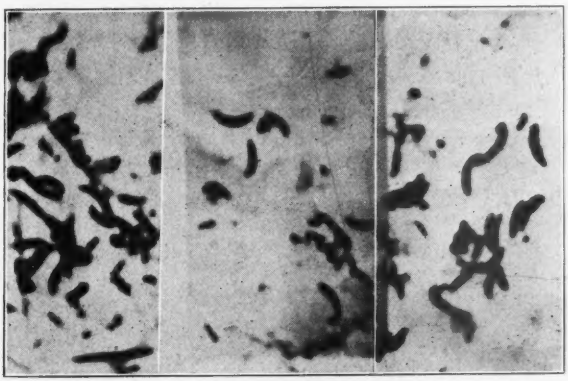

Fig. 18.—Spirillum sputigenum of Miller.

Some years ago, I suggested the name *Leptothrix falciformis* for a form with sickle shaped conidia which appeared to differ from *Leptothrix racemosa.* Recently, I expressed the view that the falcate conidia of this form could not be differentiated from the fusiformed organisms.[10]

Figure 16 shows conidia of considerable length. The striations are characteristic of many of the fusiform elements found in the mouth. Independent threads also exhibit these striations.

I have photographed about twenty specimens of the matrix. Today, these

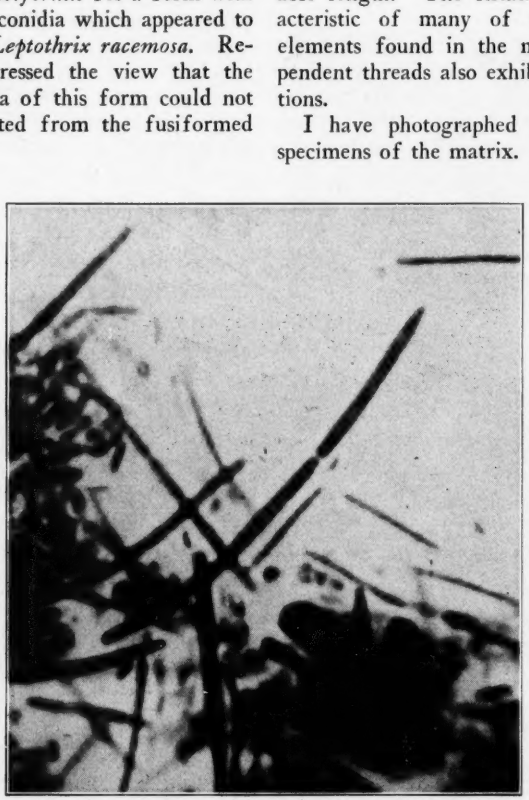

Fig. 19.—Bacillus buccalis-maximus of Miller.

The conidia of this form, as is shown in Figure 13, deviate considerably from those of *Leptothrix racemosa.*

Figure 14 also shows a specimen of this form. Note the shape of the conidia.

Figure 15 illustrates the shape of the conidia well.

10. V. Beust, T. B.: Periodical of H. C. F. D. I. (Reprint from the Dutch Dent. J.), June, 1926, p. 86.

may be regarded by some simply as so many indications of a condition. Summation of indications justifies hypotheses; added indications will finally establish the facts.

Figure 17 is a specimen taken from the depths of a pyorrheal abscess. Its curved spores present, perhaps, contributory evidence to Vicentini's view that the spirilla are derived from the threads. Yet they do not present the typical

quarter-moon shape of the spirilla; they rather approach the fusiform shape, which would link them to *Leptothrix falciformis*. These and all other forms of conidia exhibit fissiparous segmentation both before and after their detachment from the parent stalk. These micrographs were taken at a busy intersection disturbed by a continuous line of traffic and show the effects of vibration.

Although I am not yet convinced that the spirillum of the mouth grows into the fusiform organism, I feel certain that the fusiform elements grow into threads.

Figure 18 shows typical mouth spirilla. These appear to me to be more constant morphologically than the other forms.

The thread forms, as Miller and others have shown, appear in at least two varieties. The anatomy and the response to reagents of these organisms have not yet been sufficiently studied.

I presume at this time that *Bacillus buccalis-maximus* of Miller belongs in the developmental cycle of the fusiform organisms. Figure 19 shows *Bacillus buccalis-maximus*.

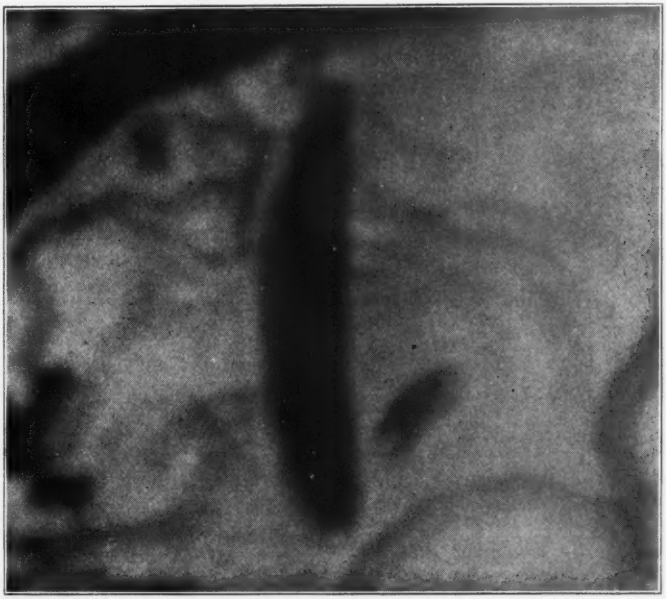

Fig. 20.—Ciliation.

Indications point to the existence of more than one matrix forming organism in the mouth. These compose the greater part of the mass of microbic deposit occurring on the teeth, quantitatively eclipsing the varieties that appear as colonies in culture experiments. Vicentini derives all forms of conidia, such as the spindle-like, the spirilla, the "serpentine and slender bacilli" from

his *Leptothrix racemosa*. Nevertheless, I would suggest the provisional assumption of at least two forms. These can be differentiated, I think, both morphologically and biologically. Morphologically, we would differentiate the cylindrical or blunt-spored *Leptothrix racemosa* from the pointed spore *Leptothrix falciformis*. Biologically, we would pronounce the former, occurring as it does in healthy areas, a harmless commensal; the latter, occurring as it does in purulent processes about the gingiva, a pathogenic form. These views may eventually need modification.

Much information may be expected from a study of the ciliation. I have stated that the falcate organisms are peritrichally ciliated. Whether this peculiarity is common to all of them I do not know. Figure 20 gives an idea of the ciliation.

The spirilla, in a few specimens observed by me, exhibit a lophotrichous ciliation. I have also seen some with a ventral tuft. I have not yet subjected these organisms to the standard methods for demonstrating the flagella. My observations were confined to chance views appearing in the preparations.

Differences in the ciliation would tend to separate the fusiform organisms from the spirilla. The spirochetes, as far as I have been able to learn, are not related to the forms here discussed. I have noticed no streptococci in these investigations and conclude that growth in the chain form is not common in the average mouth. Cocci are well represented in all inflammatory lesions of the gingiva.

This paper was framed with the intention of establishing the general and final recognition of the organic unity of the matrix. It may not accomplish its purpose. Even so, I would caution against the practice of using cultures superficially resembling the conidia of the matrix for biochemical studies of mouth conditions. While it is possible that a continuous multiplication by fission only could be induced by the artificial mediums commonly used, we must question the identity of the organisms so far cultured, until a pleomorphism, in the sense here illustrated, has been demonstrated; or, at least until the morphology of the various conidia has been accurately determined.

STAINING METHOD[13]

Float the air-dried cover-glass face down, in a watch-glass filled with the stain. Steam for 15 minutes. Do not boil. Dip in water to remove surplus stain. Differentiate in 2 per cent aqueous sulphuric acid about two to five seconds. Transfer to water containing 2 per cent natrium bicarbonicum. Wash in water; dry; mount in balsam. The process of differentiation must sometimes be repeated.

13. Solution: Fuchsin ..... 4 gm.
Carbol ..... 4 gm.
Alcohol ..... 50 c.c.
Water ..... 200 c.c.

129 E. Broadway

THE GENERAL STATUS OF OUR LAWS AND SOME IMPORTANT QUESTIONS WHICH SHOULD BE CONSIDERED IN CONNECTION WITH PROPOSED LEGISLATION*

By HOMER C. BROWN,† D.D.S., F.A.C.D., Columbus, Ohio

THE past two or three decades might very properly be considered as the legislative era in the history of our country. This is due to an accelerated tendency during this time to enact so many laws that our citizens have been confronted with innumerable specific requirements on the one hand and as many definite restrictions on the other, until the situation has become so complicated that only a small percentage can keep informed relative to their legal rights, and a still smaller percentage make any effort to observe the laws that they know to be in force. In other words, there are so many laws on our statute books that it is quite impossible for lawyers to be informed regarding all of them, even those limited to the local courts, wherein most lawyers conduct their general practice. Further, many of the local legislative restrictions, such as traffic ordinances, are changed so often that it is quite impossible for anyone to feel certain as to just what his rights and limitations are, from day to day.

As an evidence of the tendency toward further complicating the already awkward situation, there were 17,812 bills introduced in the last, or Sixty-Ninth Congress, but, fortunately, only 759 of these were enacted into law. During the last session of the Ohio State Legislature, there were 831 bills introduced, of which 224 were passed, thirty-four of these over the veto of the governor, (the executive and the legislative branches of our state government being of opposite politics).

With reference to the great number of bills introduced in Congress and the small percentage of those passed, it should be explained that, frequently, duplicates or quite similar bills are introduced in both the Senate and the House and are later merged into one bill with joint authors; also, many private bills, such as pension claims, are referred to the committee in charge of such legislation and, if approved, they are all later combined and presented in one general bill. The same is true to a modified extent with state legislatures.

There are many obsolete and useless laws on our statute books today, and any effort to eliminate, clarify and

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†Chairman of the legislative committees of the American Dental Association, the Ohio State Dental Society and the Columbus Dental Society.

codify our statutes, so as to better serve the present-day requirements, should be encouraged. The enactment of too much legislation encourages a disregard for all laws, which also tends to retard law enforcement. Such brazen indifference for our laws, by so many persons who are strict adherents to the principles of the Golden Rule and closely observe all the ethics of the professional and the business world, is conducive to a loss of confidence in both our public officials and our institutions.

As a general proposition, all legislative proposals are the result of the effort of groups or organizations to secure the enactment of legislation that will either grant them some increased privilege or tend to place restrictions on some of the privileges already enjoyed by others. Therefore, such efforts may be either considered wholly selfish or as emanating from widely divergent views relating to civic and social affairs, as well as to moral and religious questions, etc. Most of these radical legislative proposals never receive the approval of the committees to which they are referred, and those that do are usually so modified that they are not so far reaching as when first introduced. Then, when they come up for final consideration, they are often amended through compromise, which is such a potent factor in all legislation. In fact, a large percentage of enacted legislation is the result of education on the part of the proponents as well as the opponents, freely savored with the compromising influence of a few adroit and diplomatic legislators.

I have had a fairly active experience of more than a quarter of a century in legislative affairs, principally as they are involved with the interests of the dental and allied professions. I have also spent a considerable amount of time and effort in opposing radical legislation that was not related to professional affairs. During this time, I have been ultraconservative in becoming interested in promoting any legislation unless there was an outstanding need for it, for the reason that I was not in sympathy with such legislation nor interested in giving the time and energy necessarily involved. There is another phase to consider when contemplating legislation that falls short of a high standard of merit, and that is, that when a bill is once introduced, it frequently develops strong opposition and it is not altogether improbable to find oneself, or one's group, occupying a position, in the end, less favorable than at the start, since opponents may be able to amend your bill advantageously.

The personnel of the legislative bodies of today is possibly not of so high a standard as we should like to have it, or as it may have been formerly. And it is quite unfortunate that a greater percentage of our legislators are not better qualified for such highly important public service. It is also regrettable that many of them so frequently permit politics to become involved in a great number of nonpolitical legislative problems. I am pleased to pay due tribute and appreciation to the many able and high-minded men in our federal and state legislative bodies with whom it has been my privilege to come in close contact. Most of these have evidenced a keen interest in all legislation possessing any outstanding merit; in fact, the great majority of legislators seem to be willing to assist in promoting legislation when they are convinced

that those best able to judge of its merits are giving it their support, supplemented by the influence of a goodly number of their most prominent constituents.

In this connection, and also as directly related to my closing recommendation, I have no hesitancy in stating that there is no department in our organizations which requires a closer coordination of both organizational and individual effort than does our legislative activities. In the face of this, there is that regrettable apathetic inclination, so prevalent with a large percentage of our profession, to postpone or wholly neglect such duties even though they recognize that their indifference may be most detrimental. Also, there is a disposition on the part of a very limited number to insist on advancing their individual views rather than to support the provisions that have been generally approved. But the most deeply regrettable of all is the treacherous and underhanded interference by a person or persons who may seek to destroy the work and influence of those endeavoring to carry out any specific authorized assignment of legislative procedure. I deplore that conditions should have arisen at any time which would call for such strong statements, but such situations, and from sources which should be giving full cooperation, have confronted my activities in both federal and state legislation, and to overcome this unexpected opposition usually required as much effort as what would have been ordinarily necessary to assure a complete success of the undertaking. Fortunately, none of this opposition has been responsible for the loss of any pending legislation, but it has indeed made it most embarrassing and discouraging at times.

In attempting to enumerate some of the questions to be considered prior to initiating legislative proposals, I am going to assume that my recommendations are intended to apply to members of our dental organizations, functioning as does the American Dental Association with its constituent and component societies, and I therefore emphasize the following:

1. There should always be a good and valid reason for undertaking to secure the enactment of any legislative proposal, either as new legislation or as an amendment to existing law, or by wholly repealing some existing law.

2. If a group of members of one of our local dental organizations consider that they have a proposal coming within the requirements just stated in my first recommendation, it should be their duty to give most careful consideration to every phase of the question as it may occur to them. Then the proposition should be presented to their local society, either through its legislative committee, or directly, and have a full and general discussion of the subject. If approved by the local society, it should be recommended to the state society through its legislative committee. If national in scope, it should follow the same procedure, but it is very important to present these propositions to your state and national committees as far in advance of their regular annual meetings as is possible, as this gives the respective legislative committees an opportunity to consider carefully the proposals, and the time to prepare and submit their recommendations to their organizations.

3. The provisions of every bill should be as definite and as concise as is possible, and also should be absolutely free from "sleepers" or any ambiguous phraseology.

4. The details of drafting, introducing and promoting approved legislation should be assigned to your regularly authorized legislative committee, with as much authority or leeway as the organization feels justified in granting. This is quite essential as some sudden developments may come up at any time which may call for prompt and definite decisions by the committee, and they should be prepared to act.

5. The legislative committee should map out their program and call for such cooperation as they may feel necessary from time to time, from those affiliated with them. This is highly important in case of any pending legislation, when some positive opposition has developed, as no influence can be more valuable than that brought direct from the constituents of the legislators.

6. Finally, permit me to suggest that the individual members of any organization can render an invaluable service by promptly complying with such specific requests as their legislative committee may make of them, even though it is not always possible to present all, or, for that matter, any of the reasons for the particular assistance required. They should know the general problem and they should then either place full confidence in their legislative committee, or select one in whom such confidence can unquestionably be reposed.

609 Hartman Bldg.

DISCUSSION

Clyde M. Gearhart, Washington, D. C.: For some time, I have entertained serious doubts as to the advisability of discussions anent carefully, thoughtfully and pertinently prepared remarks on subjects presented to our various bodies, for the reason that many who have been selected to discuss openly a well formulated theme feel it their inherent duty to try to tear down or to destroy the net work of thought and probabilities presented by the author. To enter a discussion is not to start a fight; one should be moved to reflect that a subject is entrusted to the speaker after mature consideration of his ability to present phases pertinent thereto, all of which were combined with a superior knowledge to tabulate his ideas accurately and definitely toward the final analysis. Believing that my tolerance for speakers may not be shared by all, I feel a sort of hesitancy in appearing before you in the rôle of a discusser, for I am going to be genuinely disappointing in that I agree thoroughly with the brief but brilliant recital of the status of our laws and the significant references made to several outstanding facts which Dr. Brown has amply described and which should be considered in connection with proposed legislation. When the thought of the Army Dental Corps, which today is so highly organized and manned that its superiority does not exist in any country of the world, was in an embryonic stage, and when the seriousness of its creation was treated by many legislators with a disparaging attitude that bordered on contempt, Dr. Brown diligently and masterfully fought the battle that, in the end, spelled the success that is today our great pride. Solution of similar problems followed in the organization and perfection of Navy dental legislation that resulted in our peerless Navy Dental Corps, members of which are today assigned to all men-of-war and to foreign and local American naval bases. I recall these facts briefly, but I say confidently that there are but few here today unaware of the successful culmination of our previous dental legislative problems. During the World War, an unusual number of vexing problems fell to the lot of the legislative committee of the then National Dental Association, and being conveniently located in Washington, I was frequently called on by Dr. Brown to assist his committee in various

ways. Later on, I was honored with an appointment as a member of the legislative committee and then followed an introduction to the exigencies and hardships that befall one belonging to that august and long-suffering body. Vexatious problems on tariff legislation for the consideration of precious metals, porcelain teeth, steel instruments, rubber, cotton and innumerable commodities, on all of which the dental profession was dependent but did not know it, crept into the briefs of the committee. Strategy was layed in various instances to meet with Senators and Representatives in whom was invested authority to give or deny aid, and, in several instances, I recall that even with unwillingness, our national legislators had to withhold hope for our cause, for the reason that a lot of inactive laws then on the statutes mitigated against their giving support. Every ounce of influence was brought to bear in certain instances to have favorable consideration of our pleas. I have seen no less than four past presidents of our great American Dental Association appear in person in Washington, and I have heard these same men told by Washington officials, with sincere regret, that their requests were well taken, but that the existing laws interfered in their giving them support. If I sensed the purport of his remarks, Dr. Brown would not only suppress "fly by night" legislation, but would rescind much legislation that is on the books today and that means nothing. Let it not be said that this organization is responsible for hastily enacting legislation to support a mistaken idea that in later years will react as a boomerang. The legislative committee of the American Dental Association stands ready at all times to enter into the minute detail of legislative problems incurred by each and every one of the associated societies, and craves that consideration. If the legislative committee should be incompetent, it is up to the Board of Trustees to select one of competency. I feel no fear of contradiction when, in closing, I predict that as long as Dr. Brown can be persuaded to retain the chairmanship of the legislative committee, and can have the support of its component societies, dental legislation will not go on the rocks.

Robert R. Gillis, Hammond, Ind.: When a minority is clever and persistent enough to swing public opinion favorably, it can have what it desires. Ours is a nation of remarkable freedom, supposedly ruled by the will of the majority but really abiding the will and whim of minorities. Thus do we make progress. It is a situation that should be recognized and admitted by optimists; it is not to be considered in any way a cause for pessimism. Down through long centuries have come the basic principles of our laws. A few changes of minor details now and then cannot upset the whole structure. Legal remedies, in many respects, are not unlike those applied in the healing arts; some are local in application and some are constitutional, the latter being more far-reaching but usually less desirable. I would hazard the prediction that recent application of constitutional remedies with their ensuing sequelae of serious systemic disturbances will make our people more reluctant about trying any further constitutional remedies for a generation or two. Local applications will probably prove to be more efficient and easier to take—and easier to remove if found undesirable. When Dr. Brown speaks of "radical legislation," I assume that he uses the adjective as commonly employed today when speaking of certain political or social activities, as synonymous with revolutionary, or tinged with red. If the innovation offered is truly radical, the only redness is in the eyes of its opponents who have yet to be converted to the cause. The way of a reformer is hard until he acquires a substantial following—and then he becomes a hero. The orthodoxies of today were the heresies of yesterday; so, if you meet a "radical heretic" tomorrow, be prepared to accept him as a probable hero next week. I beg to take exception to Dr. Brown's comparison between the caliber of past and that of present legislative bodies, as unfavorable to the present incumbents of those high positions. I challenge his statement, or accept it only in the light that present troubles are always the greatest. In our democratic system of government, each community sends such a representative as the majority of the citizens in that community elect to send. It is contrary to our American political ideals to assume that the majority in any community can be wrong or unwise in their election. Possibly my opinion is provincial, for it is based solely on experience in our own locality and state of Indiana. The title of Dr. Brown's paper apparently does not contemplate dental questions in particular. We had presumed that

the word "dental" would appear in the title so that questions pertaining especially to our profession might be considered. There are several such that would prove most interesting for discussion before this section, such as dental hygienists, dental advertising parlors, dentistry in the schools, dental examining boards, dental education and national reciprocity. Dr. Brown's concluding suggestions are full of food for careful thought by any committee or group that may be charged with promoting matters of legislation.

H. Wood Campbell, Suffolk, Va.: In discussing Dr. Brown's paper, it seems to me that we are of necessity confined to the present status of dental legislation and are not concerned with general legislation such as traffic laws and the general regulating laws which are necessary for the government of the state and nation. For the purpose of this discussion, we assume that all good citizens will obey the laws as far as they are apprised of them. I cannot imagine a citizen who is a strict adherent of the golden rule deliberately violating the laws of his country and mocking at the constitution. It is quite true that our country is overburdened with laws that are foolish and often harmful. Who is to blame for such a situation? The citizen. It is the men and women who vote and, paradoxical as it may seem, those who can and do not vote, for they acquiesce by inaction in what others do by action. When the electorate is alert, intelligent and patriotic, wise and good representatives can be placed in office, with the result that we will not be burdened by foolish and unnecessary legislation. As a general proposition, all legislation is supposed to be for the general good and should be divested of all selfish desire to obtain special favors or privileges for any group, party or faction. No human law can be perfect for the reason that men are not infallible and the most nearly perfect law must of necessity work a hardship on some members of society. Therefore, legislation should have in view the greatest good to the greatest number. Fortunately for the profession of dentistry, there is no need for a great amount of legislation. There are a few basic and fundamental principles which call for the regulation of the practice of dentistry as it relates to the public health; also a limited number of requirements for putting into practice these principles. The less legislation we have, and the more direct and inclusive, the better. The profession in the last decade is to be congratulated on the progress that has been made in legislation, especially national legislation. There have been necessary and wise national laws passed by the self-sacrifice and labor of men to whom the profession owes a lasting debt of gratitude. With the growth and progress of the profession, changes in our laws are a necessity. No virile profession can afford to neglect its legislative activities, such as amendments to the existing statutes and the passage of new ones as the necessity arises. Dr. Brown has concisely outlined the method by which proposed legislation should be undertaken. The legislative committee, national, state and local, should be placed in charge of all proposed legislation. By this method, a thorough study can be made of proposed bills before they are presented to the law-making body. All unwise, injurious or class legislation can be blocked. The selection of a competent legislative committee is one of the most important functions of our national and state societies. Such a committee, with the cooperation of these organizations, can secure whatever legislation they agree on. They can amend or repeal such acts as require it, and they can block detrimental legislation either proposed by free lances within the profession or by outside interference. All proposed legislation requires planning, hard work, time and expense; therefore, it would seem to be as little as the members of the society could do to stand by the legislative committee in its work, even though they may not be thoroughly familiar with the provisions of the proposed bill and do not understand the reasons for it. Faith in the wisdom and integrity of the legislative committee should be sufficient guarantee that the interest of the public and the profession will be equally safeguarded. That no profession can attain its highest degree of proficiency without proper and adequate legislation has been demonstrated beyond controversy in dentistry, during its formative period. And not until the practice acts began to appear on our statute books did the profession begin to take on the dignity and importance which are its heritage today. The six propositions laid down by Dr. Brown are wise and comprehensive, showing his broad grasp of the subject of legislation. No fear need be felt for legislation in accordance with them.

Dr. Brown (closing): Dr. Gillis has evidently misconstrued the general purport of my paper and he also seems to have an impression that I was limiting myself largely to the situation as it exists in Ohio. It was my purpose to present this subject in its broadest phase and I merely cited the statistics with reference to the number of bills introduced and passed both in Congress and by the Ohio Legislature because I was familiar with these details. Dr. Campbell, with his long experience in state dental board and association affairs, stresses the fact that an alert electorate is the final analysis in securing adequate laws and proper enforcement of same. I am in thorough accord with this view; as well as his statement that practically every law works a hardship upon some few individuals, but its merit rests on the general good conferred upon the masses. Reference has been made to the question of the success of our legislative efforts and, since this has been discussed, I feel justified in saying that such legislative problems as I have been interested in promoting have usually been successful even though some of them have been long drawn out affairs, such as the Army and Navy Dental Corps legislation as well as our tariff legislation. I was advised today of a decision relating to our tariff legislation which is favorable both to the medical and dental professions. The question at issue was the shifting of the rate of ad valorem duty of 45 per cent on surgical instruments and 35 per cent on dental instruments as provided in paragraph 359 of the Tariff bill to paragraph 354, which changed the rate of duty to 60 per cent in both instances. This decision maintains that the rate as provided in Section 359 of 45 per cent and 35 per cent should be the duty charged in each instance. This is an important and a forceful decision, but, like all such, it is for a limited time subject to an appeal.

FUNDAMENTALS IN THE REPRODUCTION OF MANDIBULAR MOVEMENTS IN EDENTULOUS MOUTHS*

By GEORGE P. PHILLIPS, A.B., D.M.D., Boston, Massachusetts

OCCLUSION and the mandibular movements are so closely related, especially in edentulous mouths, where their reproduction is intended as an aid in restoring lost occlusion, that a brief mention of the primary and secondary factors controlling occlusion will not be out of place.

By primary factors, I mean the factors which begin to function as soon as life begins in a developing embryo, continuing up to the eruption of the first permanent molars; i. e., the keys to occlusion. In other words, the factors controlling a developing occlusion.

These, taken in sequence, are (1) the controlling action which the central nervous system has over tissue development; (2) the development of the muscles of mastication; (3) the development of the osseous structures of the mandible and the maxillae, together with the associated cranial structures, (4) the early acquisition of the various vicious habits or other extraneous interferences in children, such as mouth breathing and thumb sucking, which bring about malocclusion.

The first three of these factors, because they deal with growth or with

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the vital processes, are essentially beyond our control, in that they eventually become inherent in their nature with the individual; while the fourth factor, making its appearance after birth, and being the end-result of a habit or some extraneous interference, either known or obscure, comes under our control, if recognized early, and is, therefore, of relatively negligible importance.

The secondary factors are those which enter into the control of occlusion after the eruption of the first permanent molars, continuing up to the time of the development of a full natural denture. These factors are either constructive or destructive in their nature. The constructive ones are all those contributing to normal healthy function. The destructive ones are caries, disease, malnutrition and the many and varied causes of loss of function.

All these factors affect occlusion and, consequently, the mandibular movements, in that they mold or shape the temporomandibular joint, and affect the ligaments and muscles of mastication, that is, the whole masticatory apparatus, in such a way as to make it imperative that when any restorative work is to be attempted, each patient be taken individually and treated according to the peculiarities or abnormalities that his case may present.

In attempting, therefore, to reproduce the various mandibular movements, we must have a clear conception of what the temporomandibular joint is, and how it functions, and what parts play an important rôle in causing these various movements.

A comparative study of the various similarly functioning joints in the human body will not disclose any fundamental structural variations; but, although, studied anatomically, it will present a picture no different from that of any other hinge joint, taken functionally the temporomandibular joint will assume the nature of a complex mechanism, of which the precise manner of operation cannot be ascertained or determined by assumption, or plausible theories, or even the application of recognized geometric laws, which admittedly form the basis of all mechanics dealing with movements, but only through close scrutiny and faithful reproduction of the movements it produces.

I do not mean to belittle the importance of the application of geometry, nor any one of the various theories so far advanced in the study of the mandibular movements. I wish simply to point out the possibility of committing an error of false analogy, on the one hand, in assuming the existence of simple geometric laws governing occlusion, on the assumption that all movements produced are based on some one or more established laws, and trying to apply them to the temporomandibular joint, without taking into consideration the fact that we are dealing with material which is made up of hard and soft tissues constantly yielding under pressure; and, on the other hand, in taking the various mandibular movements as they are executed and reducing them to their simple mechanical components.

There is no analogy between the two. The mandibular movements must be taken as they are executed and recorded as such, that is, as complex combinations of curves, arcs, etc., and must be reduced to simple movements controlled by straight planes in their various directions. These movements, in order to be of any service, must be

recorded and reproduced at will, and through some mechanical means, allowing, of course, for the inherent limitations of all mechanical devices. Movements described by nonmechanical means, such as the mandible or any other movable part of the human body, can be simulated or reduced to simple mechanical movements, but cannot be reproduced with absolute fidelity with any of the mechanical means at our disposal.

The factors controlling the mandibular movements are: (1) the muscles and ligaments; (2) the inclined planes of the teeth; (3) the condyle path. Of these three factors, the first, namely the ligaments and muscles, being progressively consistent in their action with the gradual changes which take place with advancing age, is constant throughout life. With the partial or total loss of the teeth, the second and most important factor, that is, the inclined planes of the teeth, with which we are primarily concerned in the construction of full dentures, gradually is eliminated and, with it, all specific masticatory control of the movements of the mandible is lost.

With the teeth lost, therefore, the only guides that are left to assist us in restoring these lost organs, in the form of artificial substitutes, are the muscles and ligaments as the suspending and propelling means of the mandible, and the condyle path or glenoid fossa in whatever form we may find it, as the guiding means.

The factors controlling the mandibular movements in both dentulous and edentulous mouths are (1) muscles and ligaments; (2) occlusal planes; (3) glenoid fossa. These factors are known in every case except that of the occlusal planes in edentulous mouths, which is a lost factor. In dentulous mouths, the coordinate action of the muscles and ligaments with the occlusal planes of the teeth is responsible for the shape of the glenoid fossa. In edentulous mouths, the action of the muscles and ligaments with the glenoid fossa, if its condition is determined, will reveal the unknown lost factor, i. e., the occlusal planes.

We all know that, with the cusps of the teeth in contact, both extreme right and left and forward excursions of the mandible, starting from central occlusion, must necessarily pass through all the planes or directions of movement which the mandible will descibe during all its masticatory or other movements. In other words, the range of the jaw movements of any individual is contained within its extreme lateral and forward positions. All these movements are simultaneously compound movements in various planes or directions.

Starting, therefore, from central occlusion as the zero point, the mandible, when placed in an extreme lateral position, without undue effort on the part of the individual, will diagrammatically travel in three planes, radiating as three lines from a common center. These movements are guided or controlled by certain limitations or interference: (1) muscles and ligaments; (2) depth of glenoid fossa; (3) curvature of the lateral walls of the glenoid fossa; (4) size of the glenoid fossa in proportion to the condyle head.

The muscles and ligaments, acting as a means for the suspension and propelling of the mandible, in middle or past middle life, do not offer any great amount of interference save that of the gradual loss of tone.

The depth of the glenoid fossa gives us what we call the various inclinations of the condyle path, from an almost perfectly horizontal plane to a very steep, either positive or negative incline.

The curvature of the lateral walls of the glenoid fossa determines or controls the various consecutive centers of rotation around which the lateral movements of the mandible are described.

The size of the glenoid fossa in proportion to the condyle head determines, aside from the rotating movements, the bodily shifting of the whole mandible from right to left, or vice versa, during the lateral movements.

In a previous paper,[1] which was the result of almost two years of personal investigation and experimentation, I gave the following, from the standpoint of occlusion, as my conception of what the mandible really is: "The mandible is a floating member, suspended and propelled by ligaments and muscles. Is guided by the occlusal planes of the teeth when the teeth are present, and the various planes of the condyle path when the teeth are absent. These various planes of the condyle path, together with the muscles and ligaments, provide a groove-like control which guides and limits its movements."

How are we, then, to reproduce such movements as are produced by the mandible and with what means?

The reproduction of mandibular movements in dentulous mouths is comparatively easy because, during the lateral movements, and in the extreme lateral positions of the mandible, there is bound to be one or more contact points where the natural teeth of one jaw will meet with one or more teeth of the other jaw. Thus, the danger of error due to the resiliency of tissues is limited to the slight stretching of the ligaments of the temporomandibular joint.

In edentulous mouths, the resiliency of tissues and the uneven density of the mucosa under the trial plates becomes a serious source of error.

Reproduction of the mandibular movements has been accomplished, with varying degrees of success, by many of the leading prosthetists and designers of articulators. The results obtained so far in the hands of skilled operators have been more than gratifying, but unfortunately their universal adoption by all dentists has, for many obvious reasons, been neglected.

In the method which I am about to describe to you, the facebow, which is universally accepted as a necessary means in the reproduction of mandibular movements, has been entirely eliminated, and instead of using the present form of articulators, which require its use on account of their construction, a pantographic device for reproducing the movements will be employed and also a graphic recorder which embodies Dr. Gysi's principles of the gothic arch tracings.

I have previously enumerated the various controlling factors which are responsible for the mandibular movements as: (1) the muscles and ligaments; (2) the depth of the glenoid fossa; (3) the curvature of the lateral walls of the glenoid fossa, and (4) the size of the glenoid fossa in proportion to the condyle head. This fourth factor, together with a loose or flabby circular ligament, is the evident cause of the actual side play of the whole mandible during the lateral thrusts, seen occasionally.

There is one more point, which I

1. Phillips, G. P.: Dent. Cosmos, December, 1925.

do not think has been brought out before. During the lateral movements of the mandible, there are two controls brought into play; for example, if we were to take the right lateral thrust of the mandible, the outer left lateral wall of the left glenoid fossa and the right inner wall of the right glenoid fossa will be the controlling main factors of that movement, and vice versa. This double control is responsible for the lack of one single point of rotation in mandibular movements.

I use the expression "lateral walls" figuratively. They do not represent the shape of the glenoid fossa alone, but the combined action as a unit of the condyle head, the glenoid fossa with its cartilaginous lining and the tension and elasticity of the ligaments. It would be quite possible to produce a multiplicity of different movements with the same glenoid fossa, if it were possible to employ different and differently shaped condyle heads, and also if we had ligaments of varying tension and tone.

To reduce, therefore, the various complex mandibular movements into their simple mechanical components, and reproduce them with accuracy, discounting all the intermediate small curves in the concavities of the fossae over which the condyles will travel during the movements of the mandible, and which obviously no mechanical device could reproduce, I have designed a pantographic device or articulator, whose movable arm, to which the upper cast is attached, is virtually floating in its action; that is, it can be placed in any desired or indicated position and adjusted to trace and retrace any movement that the mandible may describe.

The reason for the elimination of the facebow as unnecessary with this articulator is this: A pantographic articulator is not intended to represent the human skull as most of the present instruments in use now are supposed to do, but to reproduce the movements which the various positions of the mandible to the maxilla, from centric occlusion to extreme right or left lateral thrusts, will determine, if the mandible and maxilla were replaced by casts. Therefore, the casts can be mounted on the instrument within any reasonable distance or position from the recording points without changing the angles of the various inclined planes which control these movements.

The movements of the mandible can be reproduced accurately in two ways, in both of which the Gysi gothic arch tracings are used.

I have previously spoken of the errors that are likely to enter into the reproduction of the mandibular movements owing to the resiliency of the tissues when ordinary trial plates are used. The most recent and commonly used method is the so-called checkbite method. This method is basically correct, and, if carefully used, will give excellent results; but, in the hands of by far the largest majority of operators, it is worse than useless. One serious objection to the checkbite method is the almost inevitable tripping of the occlusal or trial plates in the mouth when the mandible is placed in lateral position to obtain the checkbites.

The first method of reproducing the mandibular movements is similar to the checkbite method, in principle, but instead of using checkbites, locking molds are employed, which, I think, relieve the patient of any conscious effort of trying to assist the operator, and, in this way, another source of error is eliminated. But whether we use check-

bites, locking molds, or any other method, if one occlusal rim is allowed to touch the other during the lateral extreme positions, undue pressure is bound to be exerted on the contact side, and, on account of the resiliency of the underlying tissues, the side not in contact will be unseated just enough to cause a false reading for the horizontal inclination of the condyle path.

I have had this happen repeatedly, in test cases, and so feel quite positive that no part of the occlusal rim of one trial plate must touch its opposing mate during the extreme lateral positions.

This error can be wholly overcome by having the patient exert over the upper and lower ridges pressure equal and also of approximately the same force during the registration of the mandibular movements, as he would ordinarily use during mastication.

LOCKING MOLD METHOD

The impressions of the patient's mouth are taken in the usual way and the casts are made. Then, a flat plate of metal of the general ridge outline of the upper cast is taken and with it a molding compound impression is taken. The tray is pressed down into the compound until the metal plate almost touches the ridges. The excess compound is then neatly trimmed off. This constitutes the base for the upper trial plate on which an occlusal rim of beeswax or some other easily workable wax is built. For the lower jaw, a flat horseshoe plate is used in the same manner. These are carried to the patient's mouth, and, the occlusal plane being established, are trimmed for the proper fullness and bite length in the usual way. With this operation completed, a tripod, made for the purpose and with an adjustable jackscrew carrying a free moving ball, is inserted over the lower plate. The lower occlusal rim is then removed and the jackscrew is adjusted to the proper bite length and is locked in that position. Centric occlusion is obtained with the aid of a pair of incisal path markers.

The patient is then instructed to place his jaw in the extreme right or left position, and, by watching the tracings made by the path marker, the operator locates extreme positions, and the trial plates are locked with the aid of small pieces of softened molding compound. These locking molds are preferably marked as right or left, as the case might be.

During this process, the pressure that is exerted over the upper and lower ridge is equal or nearly so, because of the fact that the position of the tripod, with the jackscrew attached, brings the pressure through a single contact point from the lower jaw to the center of the upper jaw at a point where the median line, if extended horizontally backward over the established occlusal plane, would intersect, at right angles, a straight line drawn from right to left at the second bicuspid region. The free moving ball of the jackscrew easily slides over the flat metal surface of the upper trial plate, exerting a constant pressure equal to the masticating pressure of the patient and located within a small radius of the median line and the second bicuspid region.

The advantages of this method over the present method can be readily seen, in that the reproduction of the mandibular movements is carried out under the same pressure conditions as those which we will meet when the dentures are completed and functioning.

THE GRAPHIC METHOD

The graphic method, although fundamentally along the same line, does not require locking molds. The whole operation of registering and reproducing the mandibular movements is done graphically; that is, the movements are seen as actual displacements on a pair of dials with pointers.

As in the locking mold method, there are two incisal path markers used, their tracing points being made of pencil points, which trace the gothic arches on white cardboard.

The use of two gothic arches simplifies the mounting of the casts on an articulator, and it further prevents the shifting of the heels of the casts from right to left during the mounting process.

In the graphic method, the horizontal inclination of the condyle path is determined by the up and down movement of the pencil points during the mandibular movements.

This up and down movement of the pencil points is utilized to record the vertical and forward displacement of the condyles in the glenoid fossa with the aid of a pair of dials and pointers, eliminating the necessity of using locking molds. Thus, when the appliance is placed in the patient's mouth and he is instructed to move the mandible from right to left, the movements can be seen, and be noted on the dials.

The lateral controls in this method are determined by the pencil tracings of the two arcs which form the gothic arch.

In these two methods which I have described, I have endeavored to bring out the one main and fundamental point necessary in the construction of full dentures, and for that matter all dentures, prior to their actual construction; and that is, the necessity of ascertaining and reproducing the mandibular movements, under the same pressure conditions and freedom of jaw movement, and prior to the construction of the dentures, that obtain when they are executed under actual masticatory conditions.

FURTHER STUDIES OF BACILLUS ACIDOPHILUS IN ITS RELATION TO DENTAL CARIES*

By RUSSELL W. BUNTING, D.D.Sc., GAIL NICKERSON, B.S., and DOROTHY G. HARD, D.D.S., Ann Arbor, Michigan

As a continuation of the former work on this subject[1] which was done in this laboratory, we have carried on during the past year a rather wide survey of the occurrence of *B. acidophilus* in the mouths of various types of individuals, to determine the relationship which it bears to the amount and type of dental caries present in each case. In a group of 184 individuals, ranging in ages from 2 to 40 years, who were distinctly immune to dental caries in that there was no evidence of dental caries ever having been present, 183 gave cultures negative to *B. acidophilus*, and one, a positive culture. In another group of 243 individuals of practically the same range in age, all of whom had active caries, cultures from around the teeth of 237 were positive for *B. acidophilus* and six were negative. In the entire group of 427 cases, the correlation between *B. acidophilus* and the presence or absence of active caries was 98.35 per cent.

In many instances, it was found that *B. acidophilus* was present in the mouth, but distinctly localized to certain areas of the teeth that were undergoing caries, and was either absent or present only in very small numbers in other portions of the mouth. In this, there was a distinct evidence of localization and protection beneath a film, or plaque, by which the activities of these organisms were confined to the specific areas involved.

There were distinct evidences that the presence or absence of *B. acidophilus* in the mouth is dependent on the age, general health, diet, and general bodily metabolism of the individual, these acting through the creation of oral conditions that are favorable or otherwise to the growth of that organism.

Caries-like lesions of the teeth were produced in the mouth by the application of cultures of *B. acidophilus* and breadstuff to the surfaces of the teeth over a period of several weeks. The rate at which the decalcification took place was dependent on the quality of the teeth, those of certain immune mouths showing considerably higher resistance than those in which caries was active.

It was found that, when solutions of metaphen were used in the mouth as an antiseptic in conjunction with thorough oral prophylaxis, and were

*From the Laboratories of the College of Dental Surgery, University of Michigan.

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1. Bunting, R. W., and Palmerlee, Faith: Rôle of Bacillus Acidophilus in Dental Caries, J.A.D.A., 12:381 (April) 1925.

repeated on several consecutive days, *B. acidophilus* overgrowths may be markedly reduced and often completely eradicated. The effect of such treatment is not uniform, in that, in certain mouths, its use is attended by only a partial reduction of acidophilus overgrowths, and complete eradication is seemingly impossible. The failure to rid the mouth of this particular organism may be due either to the presence of conditions specially favorable to the growth and activity of *B. acidophilus* or to the presence of a particular type of this organism against which metaphen is not highly active.

The use of metaphen in conjunction with oral prophylaxis invariably produces an improvement in the oral hygiene, and, in cases of high infective activity or in mouths that are habitually unclean, a pronounced change in the clinical appearance often occurs, more marked and more permanent than may be attained by mechanical prophylactic measures alone.

The value and effectiveness of the use of metaphen in conjunction with oral prophylaxis as a means of preventing the occurrence of dental caries cannot, at the present time, be stated. When used in cases of spreading caries of the buccal and labial type, it seems to have a definite controlling effect and, if properly applied, will effectually check many cases of this type. The method of treatment adopted in our study is as follows: The mouth is first charted and all open cavities, fillings and the general condition of the teeth and oral cavity are recorded. All open cavities are filled at once, with either permanent or temporary materials, as the condition may require. The mouth is then given a thorough prophylactic treatment, special attention being given to the removal of all films from the surfaces of the teeth. Metaphen 1:500 is then applied topically, and carried into the approximal spaces with floss. The patient is then given a mouthful of metaphen 1:5,000, which is held in contact with the teeth for one minute. This procedure is repeated on three to five consecutive days or until cultures negative to *B. acidophilus* are obtained. Subsequent cultures are taken each month, and if they are found to be positive as to *B. acidophilus*, two or three similar treatments are given until the mouth is again free from *B. acidophilus*.

It is highly desirable that dental practitioners everywhere cooperate in the study of caries control by using these measures or modifications thereof on particularly susceptible cases in their practices, and that they record the subsequent incidence of dental caries, to determine the effectiveness of such measures in the control of this disease.

VARIATION AND ANATOMY OF THE JAW BONES*

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THE rate of speed which the progress of dentistry has been registering during the last score of years is phenomenal. If a comparison were possible, it is questionable whether the swiftness attained either by an automobile or by an aeroplane could surpass the intellectual speed with which dentistry has been forging ahead. Supposing one were comfortably seated in the vehicle with which dental progress has been making its headway, and attempted to view the landscape of the territories covered, would it be possible to get more than a general idea of the land traversed? Indeed, the greater the speed, the less defined individual objects become. Smaller objects fuse into one large mass. We become conscious of magnitude alone and of such objects only as make up larger images. When we thus speak of the progress of dentistry, we little realize what is actually implied by the term. Does the term "dentistry" still retain its original meaning? Has the dentistry of many years ago progressed to its present state, or is the present concept of dentistry different from that of years gone by?

A conclusion that might safely be reached is that the meaning of the term dentistry has changed. Years ago, it meant the many things one man could do in his actual practice. Today, the term embraces the many practices devoted to special branches, all of which are concerned with the oral cavity. Thus, we now have specialized branches devoted to operative dentistry, root canal therapy, oral surgery, orthodontia, prosthodontia, pathodontia, periodontia, pediodontia, etc. The term dentistry, therefore, embraces today the profession as a whole, as it is composed of special branches. In this respect, the progress of dentistry has been sound, because it inadvertantly solved one of the fundamental problems entailed in all development; namely, division of labor for the perfection of function.

There is no doubt that dentistry as a whole has profited both by its division of labor and by its perfection of function. Practical dentistry of today is certainly better than that of any other day. But, as must be admitted, we are as yet a great distance from perfection. This congress bears evidence of the desire to exchange ideas. What other purpose is there in exchanging ideas if not for improving that which the ideas stand for? The realization of this fact is encouraging. It is because of this that I undertook the task of making a contribution to this section. It should be understood that I have nothing new or startling to offer. I have in the last twenty years been in close touch with a vast amount of anatomic material. I have made no new anatomic discov-

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eries. What I have done is to adopt new ways of learning old things. This appears to be of some significance.

The flight in our progress has taken us to such altitudes that we seem to have lost contact with the ground. In our craving for the establishment of newer records of altitudes, we are leaving fundamentals behind. It is only when new measures are to be adopted or new principles established that we reach out for support to the ancient structures erected before we took to flight. Under such circumstances, we fail to realize that we cannot erect twentieth century steel structures on an eighteenth century foundation. The attempt is made and the result is incongruous. But no one seems to care.

It is just because of such a situation that conclusions from important contributions to dental science are based on traditional evidence, having no scientific foundation. One of the most frequently appearing principles used as a basic and fundamental point of departure for scientific deductions is that of the mandibular equilateral triangle. According to this "creed," the human mandible is built on a plan having three sides of equal dimensions, a triangle, the points of which will invariably touch the centers of the condyles and the interproximal point of the lower central incisors. There are new creeds now developing for which other geometric figures perform the function of the triangle, from which anatomic generalizations are reached. But this is not surprising when we read today in textbooks on anatomy, that, at birth, the angle of the jaw is about 175 degrees. After the first dentition the ramus forms with the body of the mandible an angle of about 140 degrees. . . . In the adult, the angle formed by the ramus and body is near a right angle. . . In old age, after the fall of the teeth, *the angle* formed by the ramus and body is again increased. Such statements are quite all right as far as undergraduate teaching is concerned. Students have to be drilled to grasp certain elementary ideas. But, not uncommonly, significant contributions to dentistry use such quotations as a scientific background.

M. H. Cryer long ago showed the fallacy of adopting the equilateral triangle idea as a scientific basis for any deductions of consequence. He showed, by contrast, that Bonwill's conclusions

TABLE 1.—CHANGES IN DIMENSION BETWEEN THE MAXILLOMALAR SUTURES

Stage*	Number	Mean in Mm.	Standard Deviation in Mm.	Absolute Increase or Decrease in Mm.	Percentage Increase or Decrease
I	6	65.99	2.82	----------	----------
II	9	72.68	4.05	6.69	10
III	10	82.50	4.60	9.82	13
IV	11	93.20	6.85	10.70	13
V	18	98.60	5.50	5.40	6
VI	23	102.15	5.85	3.55	4
VII	13	101.15	6.55	—1.00	—1

*I, early infancy; II, late infancy; III, childhood; IV, pubescence; V, adulthood; VI, old age; VII, senility.

were baseless, and perhaps accidental. But Bonwill's idea did take root in dentistry. Even today, there are important dental instruments on the market claiming superiority because they are developed on the basis of the equilateral triangle. What is true in this instance is true in all other schemes worked out with a purpose of putting something on the market. The dentist, as a rule, is an easy mark for it all. The reason is that, in general, we have not as yet freed ourselves from certain confusing situations. What is not quite clear to most of us is the distinction between elementary principles and fundamental facts. On this account, elementary ideas are often used as scientific proof for important conclusions.

For example, the elementary ideas involved in connection with the change in the mandibular angle is that, at birth, the ramus and body constitute a straight line, or an angle of 175 degrees, which is pretty close to it; in the adult, the angle is "nearly a right angle," becoming obtuse again as old age is reached. This line of talk, in connection with the equilateral triangle, has always been vigorously pursued in conjunction with many "important" devices used in dental practice. I am mentioning the angle of the jaw and the triangle, because they are more frequently made use of in dental literature than any other anatomic part. As far as my interest in the matter is concerned, any anatomic part that I shall refer to will carry the same conviction.

What I wish to direct your attention to is the fact that, whether it is the angle of the mandible, the whole mandible, the upper jaw or the whole skeleton, the fundamental principles involved regarding their form or size are the same. In other words, whatever form a structure may assume, the general tendency is for it to vary. It is sheer nonsense to attempt to deduct a definite and precise figure for a certain anatomic structure and imagine that all like structures will conform to it. This is the point that I wish to stress most in what I have already said and what I am going to say. There are no two individuals who are alike, and there are no two anatomic parts of one individual that are alike. Not even the two sides of a bilateral structure like the jaw bones are precisely alike. Everything that is produced by life processes is subject to variation. Raymond Pearl rightly de-

TABLE 2.—CHANGES IN DIMENSION IN BASAL DEPTH (LENGTH) OF MANDIBLE FROM MENTON TO GONION.

Stage	Number	Mean in Mm.	Standard Deviation in Mm.	Absolute Increase or Decrease in Mm.	Percentage Increase or Decrease
I	10	40.80	1.94	----------	----------
II	11	48.46	2.82	7.66	19.0
III	7	62.32	3.93	13.86	29.0
IV	7	72.50	4.50	9.83	16.0
V	15	79.39	5.01	7.24	10.0
VI	20	79.50	5.20	0.11	0.1
VII	14	77.79	4.59	—1.71	—2.0

fines variation as "the word used in biological sciences to name the observed fact that no two individual organisms are precisely alike." I wish I could make this definition the motto of this Congress. It would help the profession tremendously toward ridding itself of many unnecessary missteps. In addition to this definition, permit me to add Prof. T. H. Morgan's statement "that we recognize at present biological variation as arising from environmental effects met with in the course of development, or from effects due to different recombinations of genetic factors, or from new effects produced by a change of some sort in the germinal material."

Whatever it may be due to, the fact remains that, like other parts of the living organism, the jaw bones are subject to the same law of variability. If a quantitative analysis is made of either of the jaw bones or of only a part of them, this fact becomes quite clear. Let us examine, for example, the changes in width brought about by development of the maxilla (Table 1). The measurements taken between the maxillomalar sutures of the maxilla of six skulls in early infancy (I), before the completion of the deciduous dentition, give an average for the width of 65.99 mm. But not all of them are of the same dimension; some are more than that, and some less. The standard deviation is 2.82 mm. This shows that, while the entire group tend toward a certain length, 68 per cent of them vary around this type. If another group of skulls (nine) of later infancy (II), when the deciduous dentition is completed, are treated in the same way, a different average (72.68) is obtained as well as a different standard deviation (4.05). This procedure may then be followed up through various stages of development, such as childhood (III), when the first permanent molar is erupted; pubescence (IV), when the second permanent molar is erupted; adulthood (V), when the third molar is erupted; old age (VI), when the teeth show considerable wear, and senility (VII), when excessive wear is accompanied by loss of teeth. In each of these stages, it will be noticed that the dimensions tend to a certain average and its standard deviation. The deduction that may be derived from this procedure is that each group in a certain developmental stage varies from that in another stage. But the fact remains that each individual composing the group also varies from the other individuals. This kind of variation is

TABLE 3.—CHANGE IN MANDIBULAR ANGLE IN THE COURSE OF DEVELOPMENT

Stage	Number	Mean in Degrees	Standard Deviation in Degrees	Absolute Difference in Degrees
I	11	138.19	3.15	.....
II	11	132.46	5.55	—5.73
III	8	124.25	3.90	—7.21
IV	7	122.16	2.40	—2.09
V	15	117.39	5.58	—4.77
VI	21	115.65	4.35	—1.74
VII	14	116.80	6.95	+1.15

TABLE 4.—COMPARISONS IN BASAL DEPTH (LENGTH) OF MANDIBLE

	Ancient American Indians	Flat Head American Indians	Occipital Flattening Am. Ind.	Whites W. R. U.	Whites Salzburg	Negroes W. African	Australians	Tasmanians	Hindus
Mean in Mm.	79.39	78.92	81.80	77.84	73.30	79.10	79.74	85.00	71.20
Standard Deviation in Mm.	5.01	4.74	6.33	4.83	5.43	8.10	3.75	5.79	3.75

due primarily, as Morgan says, to "environmental effects met with in the course of development."

A similar procedure with another part will yield a like result. Let us now measure the body of the mandible. Table 2 gives the detailed account of what happens to the basal length of the mandible in the course of development. It will be seen that, while the two parts follow in a general way the same course in their development, they differ from each other in some particulars. The rate at which the mandible lengthens is higher than that at which the maxilla widens. Thus, we see that variation prevails among different developmental groups, among the individuals in the same groups and in the different anatomic parts of the same individual. The mandibular (gonial) angle too follows the same trend of variation. Table 3 illustrates the manner in which the changes occur in the course of development. But the course followed by the angles—any angle of the face—is in a negative direction. That is, the angle is always getting smaller as development goes on. But it must be emphasized that it never begins nor ends in a straight line. The largest angle observed was that of a fetus of 6 months, and that measured 142 degrees.

Another example of variation may be gathered when different racial groups are studied. Table 4 gives an account of the differences found in the length of the mandible of different races. The measurements were made on three different types of American Indians, two types of Whites, one group each of West African Negroes, Australian Aboriginals, Tasmanians and Hindus. Each group varies from the other, and

the individuals vary in each of the groups.

This is but a small sample of a large number of facts bearing on the variation of anatomic parts, the recognition of all of which is essential. We must realize that, in the discharge of our duties, we are obliged to face a great variety in kind of individuals. They differ in a thousand ways physically, and in more ways mentally. Would we expect to see such a large array of individuals built on an identical structural scale? Studies of this sort are helpful to open one's eyes and broaden one's views. It must be remembered that quantitative analysis has pointed out more facts about life phenomena, in the comparatively short time of its existence, than have ever been pointed out before. By this method, it is possible to analyze the magnitude and attributes of any organ, structure or function. The analysis of proportion, or of the relationship of one dimension to another of the same structure, is also of great value. In such studies, the fact will become evident that variation is the chief problem at issue. Our aim should, therefore, be to learn to understand the manner in which one thing differs from another.

Just think of a standard of occlusion, as it is given by most of the authoritative textbooks, which is established on the basis of one skull, and that of unknown origin. And how about various devices intended to facilitate dental procedures that are based on certain assumed geometric figures? Or, what about various anatomic schemes devised on theoretic hypotheses that have no basic foundation nor scientific background? It is about time that the profession wake up to the fact that no two living things are exactly alike, and that no two parts of the same living thing are exactly alike. This is because all that lives grows; growth is subject to modification, and any modification of growth in a particular direction produces a change in form.

There is, therefore, no form in any living structure corresponding to an accurate symmetrical geometric figure. The law of variation takes care of that. We must, therefore, modify our concept of form and structure and establish it on the basis which recognizes that all anatomic parts are subject to variation and that the word "variation" is used to call attention to "the observed fact that no two individual organisms are precisely alike," and that it is a certainty that the human jaw bones are no exception to this.

PREVENTIVE DENTISTRY FOR THE UNDERGRADUATE*

By GEORGE KERR THOMSON, D.D.S., F.A.C.D., Halifax, Nova Scotia

PREVENTIVE dentistry is, to me, the most important branch of our profession, and until recent years it has received the least consideration. During the last ten years, the literature published and the time spent in discussing it and developing methods for its teaching and practice have equalized its neglect of former years in favor of operative restorative measures.

I first became really interested in the subject twenty years ago, when we started some oral hygiene propaganda in cooperation with educational and public health institutions, and, in 1908, on the establishment of our dental school, I agreed to teach oral hygiene with crown and bridge work and ceramics.

Subsequently, we discovered that it was too important a subject to be taught as an appendage to other subjects and on my appointment as dean, I accepted the newly established chair of preventive dentistry.

In the teaching of preventive dentistry to undergraduates, two questions naturally arise: 1. What shall they be taught? 2. How shall we teach it?

With regard to the first question, after careful consideration of volumes of literature containing the ideas and methods of most eminent practitioners and educators, doubtless we will agree that the undergraduate should obtain sufficient knowledge of anatomy, physiology and biochemistry, and the effect of food, exercise, etc. on the expectant mother to enable him to instruct his patients so that his advice, if followed, will produce the desired results.

His knowledge of physical diagnosis and of various foods and their effects on the human body should be such that he will be able to diagnose the physical condition of the expectant mother and, in cooperation with her medical adviser, prescribe the diet that with the necessary exercise and mode of living will be productive of not only sound dental organs, but also a healthy body. In this connection, a knowledge of the investigations and conclusions of Gies, Howe, Price and Pickerell is very desirable. The idea of cooperation with the family physician is of great importance and should be encouraged to a greater extent by our teachers and the profession generally than is the case at present.

Now, how and when is the student to obtain this knowledge?

At recent meetings of the American Association of Dental Schools, and elsewhere, valuable suggestions have been offered, with which you doubtless are familiar. In teaching of preventive dentistry, we must agree that the subject is so closely related to other branches of dentistry and also to medicine, and so interwoven with them, that

it is impossible to discuss it without mentioning them.

Therefore, I recommend that, in the treatment of the various subjects in our curriculums, preventive dentistry be considered as of primary importance and that each teacher be requested to refer especially to its relation to his particular branch. In Canada, two of our schools are following this suggestion, teaching it as a separate subject and, from the beginning of the course, especially emphasizing its importance. This is done also from the standpoint of public health, and the student is encouraged to take an interest in this aspect of it, the attention of women being particularly directed to the sphere of public health dentistry which is peculiarly their own.

So far, I have been considering the subject from a prenatal standpoint. Of equal or possibly, as some of our modern investigators affirm, of more, importance is the treatment of the child from birth to school age. It is unfortunate that the child does not generally come under the observation of the dentist earlier than is usually the case. A vast improvement can be made in this connection by educating the medical and dental student together, so that the teacher, dentist and physician can cooperate to a greater extent. When the physician realizes his responsibility in this matter, and there is evidence that he is beginning to do so, it will facilitate materially the preventive dental treatment of children from birth to preschool age.

Some years ago, in Nova Scotia, we were fortunate in having established a preschool age dental clinic, the records of which conclusively prove that, instead of having children enter school 90 per cent imperfect from a dental standpoint, it is quite possible, by prenatal instruction to parents, and prophylactic treatment including correct diet and operative procedures, to have them enter almost 100 per cent perfect, not only from a dental standpoint but also from that of general health. This clinic is now conducted in our university health center, and our university students, both medical and dental, receive practical demonstration of preventive dentistry therein.

It is my belief, and for several years I have advocated it repeatedly, that clinics of this kind should be established wherever possible, not only throughout Canada and the United States, but also throughout the world. Propaganda for this particular phase of preventive dentistry should be instituted at this meeting and should become one of the important objectives of our international congress. It is not only of importance to the education of the dental student but also to the education of the medical student and the general public. In Canada, in this connection, we are receiving the cooperation of federal and provincial governments, and the Red Cross and other health organizations, as well as the medical profession.

From an educational standpoint, then, we will suppose the student has received sufficient knowledge of prenatal and preschool age treatment.

Now, what about the operative standpoint?

Recent research by Bödecker, clinical experiments by Hyatt and radiographic investigations by Raper, with which you are all familiar, prove conclusively that members of our profession generally have neglected obscure cavities, some of which are noncarious and which even a toothbrush bristle will not enter, and in which the finest pointed explorer will not catch. Some of these cavities, hav-

ing no more width than the thickness of a hair, have been conservatively estimated by Bödecker to contain at least 5,400,000,000 bacteria. What shall we teach the undergraduate with regard to their preventive and operative treatment?

We all realize that orthodontists, prosthetists and operative dentists consider the idea of prevention in every appliance inserted and operation performed, but is this point emphasized sufficiently in teaching our undergraduates?

Dr. Hyatt's methods, as explained to me, although they seem radical to many of our profession, are not really unreasonable and are certainly of great value. Even if they are not generally adopted, the discussion they have aroused has directed our attention to cavities, which, as I have said, have been neglected, with disastrous results, and whether or not this method of preventing their development is desirable, the attention of our students should be directed to their existence, and practical methods of prevention should be taught regarding them. Dr. Hyatt says: "In those parts of the tooth where the fissures or pits do not penetrate more than one-third of the thickness of the enamel, they can be obliterated by operative means without filling, so that they can easily be kept clean by ordinary toilet of the mouth. If they are not removed they form lodging places for the formation of carbohydrate material and bacterial plaques with resultant disintegration of the enamel."

Another important factor in dental disease, possibly one of the most common factors, is traumatic occlusion. Is the undergraduate sufficiently impressed with its importance as a common cause of periodontoclasia and other lesions? There is a great difference of opinion regarding this, but it must be admitted that the elimination of abnormal stress from diseased teeth does restore them to health and also prevents a recurrence of disease. Therefore, a student should be thoroughly instructed in the diagnosis and treatment of traumatic occlusion.

Research by Box, Stillman and McCall proves that the first sign of disturbance of equilibrium by traumatic occlusion can be observed microscopically and, if not corrected, will surely increase. The student should certainly be taught the use of the microscope for the purpose of recognizing these and early signs of disintegration in other parts of the mouth, and the proper procedure to prevent their development and recurrence.

The demonstration of the toothbrush on manikins and infirmary patients is a most important matter, and the student should be taught how to demonstrate to his patients the use of the brush as advocated by Charters, Stillman and others. He should also be able to instruct them in the home care of the mouth and teeth.

I, therefore, recommend that undergraduates be taught to conduct a thorough prophylactic treatment, which shall include the above mentioned procedures. Did time permit, there are other phases of teaching preventive dentistry that might be properly considered. I have simply suggested ideas which in my experience in practice, as well as in teaching, have occurred to me as desirable of general adoption and which in many schools are not given sufficient consideration.

METALLURGIC PHENOMENA IN DENTAL ALLOYS*

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THE interest of the dental profession in the science of metallography, in its application to the field of dental alloys, has greatly increased in the past few years, owing, possibly, to the attempt of the dental manufacturers to produce more useful as well as more profitable alloys, and also to the great number of failures encountered with the metals and alloys now in use. It is not at all uncommon to find a dental practitioner illustrating the favorable or unfavorable conditions in metals by the use of photomicrographs,[1] and a dental manufacturer outlining a method of heat treatment based on the temperature-composition diagram of the alloys under discussion. A series of such articles by Yasui and Fukushma,[2] showing the effect of rate of cooling on cast alloys as well as some general metallographic phenomena, have recently appeared in a Japanese periodical.

The investigations of the internal structure of alloys is of decided value in the determination of their physical properties, and, consequently, of their usefulness under various conditions, and is of corresponding value to the dental profession, in choosing the proper alloys from the numerous articles on the market.

One of the minor modifications brought about by this increased activity on the part of the dental manufacturers in improving their methods is the change in the designation of the gold solders. Formerly, these were almost invariably referred to as 22-carat solder, etc., meaning that the alloy was to be used to solder 22-carat gold and had no reference to the carat of the solder itself. Now they are usually designated as 725 or 625 fine, thus giving the percentage of gold in the alloy. These data, in combination with the melting points of solder and alloys which are also usually furnished in the advertising material, give the practitioner accurate information regarding the final result obtainable by the use of one solder or another in connection with the particular case under consideration.

It must be remembered that the structure of the alloy is modified by the soldering operation. The cross-section of a soldered joint, if examined under the microscope, would no longer show a homogeneous structure, but would consist of the annealed alloy, the solder partially alloyed with the origi-

*Read before the Section on Physics, Chemistry and Metallurgy at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 23, 1926.

1. Roach, F. E.: Denture Castings from an Engineering Standpoint, J.A.D.A., 13:350 (March) 1926.

2. Yasui, S., and Fukushima: Shikwa Gakuho, 31:261, 358, 574, 1926.

nal metal and the pure solder.[3] The solders seldom have a homogeneous structure as do the casting metals so that a soldered joint does not have the physical properties of the cast alloy. The solders are largely composed of some solid solution surrounded by eutectics, which are used because of their lower melting point, allowing them to be completely fused before the casting alloy has been melted. This structure

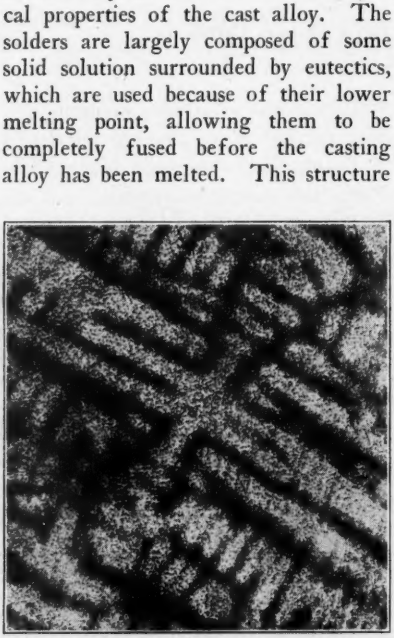

Fig. 1.—Gold solder 625 fine; cooled slowly. (× 150.)

is shown in Figure 1, which is a typical 625 solder having a low melting point. For comparison, Figure 2 shows the structure of a cast 22-carat alloy. If the alloy has been worked before soldering and reheated to the melting point of the solder, its structure again changes as shown in Figure 3, which is a typical structure of a solid solution worked and annealed. If the alloy had been given a heat treatment and subsequently soldered, it would also effect the results of this treatment. (Figs. 4 and 5.)

The proper method of annealing gold and its alloys, although of less importance now than formerly, owing to the introduction of numerous casting methods, has never been definitely determined. The technic, as described, generally consists in heating the alloy to dull red heat and quenching in water or acid, the latter to remove surface

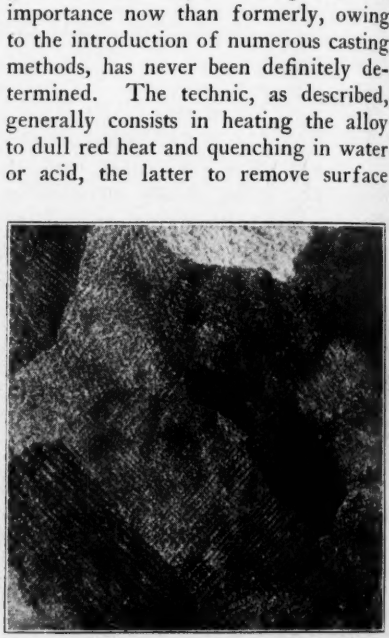

Fig. 2.—AuCuAg 22K.; cast. (× 30.)

oxids. This is undoubtedly satisfactory in some cases of the pure metals, but the time factor as well as the temperature must be considered in annealing some of the more complex alloys.

The theories of the annealing phenomenon are to a certain extent conflicting, although the practical methods of annealing are more definitely established. Theoretically, the process consists of a recrystallization of the deformed or broken crystals caused by mechanical working, which has resulted in some deformation of the metal.

3. Williams, R. V.: Internat. J. Orthodontia, 11:1, 1925.

The recrystallization is only possible above certain temperatures, depending on the alloy and the amount of mechanical work to which it has been subjected. Annealing restores the metal to its original soft condition, with a crystalline structure somewhat similar to that of a cast metal. This recrystallization required some time for its completion, and consequently, for thorough annealing, the alloy must be heated to a sufficiently elevated temperature and maintained at that temperature till all of the deformed crystals have been reformed into the new crystalline structure. As the temperature is increased, this rate of formation increases, so that at a high temperature less time is required for complete annealing.

Fig. 3.—AuCuAg 22K.; worked and annealed; heated at 875 C. for one-half hour. (× 30.)

Fig. 4.—AuCu 25 per cent Cu; cooled slowly to 375 C., and heated for twenty-four hours. (× 150.)

In considering methods of annealing, the gold alloys used in dentistry can be classified into two divisions depending on the presence of appreciable amounts of copper. It has long been known[4] that gold forms two compounds with copper, AuCu, and $AuCu_3$, at approximately 380 C. or 720 F. The composition of the AuCu compound corresponds to an 18-carat alloy and the effect of the formation of this compound extends to alloys of both greater and less percentage of copper. The probability of such a compound having any effect on an alloy containing less than 4 per cent copper is very small, as the temperature of formation, and, consequently, the rate of formation of the compound, decreases rapidly as the percentage of copper decreases. Alloys of approximately 22-carat containing less than 4 per cent copper and some silver can be considered as forming only solid solutions.

To determine experimentally the con-

4. Kurnakow, Zemezuzny and Zasedatelew: Internat J. Metals, 15:305, 1916.

ditions necessary for recrystallization, the metal was melted under borax, cooled slowly and examined under the microscope for inclusions or imperfections of any kind. It was then subjected to deformation by rolling till all traces of crystalline structure, as visible under a low power microscope, was destroyed. The metal was now annealed at intervals of approximately 50 degrees at temperatures ranging from 200 to 1,000 C., each temperature being maintained for thirty minutes, the metal then being quenched in water. The compositions of the alloys used for this work are shown in Table 1.

Fig. 5.—AuCu. 25 per cent Cu; cooled slowly; heated twenty-four hours at 375 C., and then heated for two hours at 850 C. (× 150.)

Fig. 6.—Pure Au; worked and annealed at 200 C. for one-half hour. (× 30.)

TABLE 1.—COMPOSITION OF ALLOYS

Alloy	Gold	Copper	Silver	Platinum
1	100			
2	22	1	1	
3	88	2	4	6
4	95	5		
5	90	10		
6	85	15		

The pure gold shows complete recrystallization when held at 200 C. for thirty minutes and a continual increase in grain size as the temperature is increased to 1,000 C. (Figs. 6-8.) By representing the grain growth by the increase in the grain areas and plotting the reciprocal of the grain number per square centimeter, which is equivalent to the average grain area, against the temperature of annealing, the range of temperature in which maximum grain growth occurs can be determined. Figure 9 shows the curves calculated from the results obtained by annealing two samples of pure gold at the given temperature intervals. It can be seen that the increase in the size of the grains is greatest above 550 C., and, above this temperature, the rate of growth remains fairly constant up to 1,000 C., which

was the maximum annealing temperature.

The 22-carat alloy shows only incomplete recrystallization when heated to 537 C., and cooled immediately, but complete recrystallization at 871 C. with moderately sized grains. By heating to 371 C. for twenty-four hours, almost complete recrystallization of the alloy can be obtained with very small grains and with a more uniform structure than the short annealing at 537 C. This indicates only that recrystallization is a function of both temperature and time of heating. The greatest grain growth in this alloy occurs above 875 C.

The 6 per cent platinum alloy with 3 per cent copper shows complete recrystallization on annealing for one-half hour at 371 C., forming moderately sized grains. It is similar to the pure gold in its increase in size of grain at an increased annealing temperature, and, when heated to 875 C. for one hour, the grains are almost as large as in the original casting. (Fig. 10.) The maximum grain growth in the alloy occurs above 650 C. This indicates that a 6 per cent platinum alloy containing only 3 per cent copper can be satisfactorily annealed at a lower temperature than a 22-carat AuAgCu alloy containing 4 per cent copper. In each case, the alloys were rolled till the crystalline structure of the original casting was no longer visible at a magnification of 50 diameters. (Fig. 11.)

Fig. 7.—Pure Au; worked and annealed at 815 C. for one-half hour. (× 30.)

Fig. 8.—Pure Au; worked and annealed at 925 C. for one-half hour. (× 30.)

The copper alloy containing 5 to 15 per cent copper shows the first signs of recrystallization at 525 C. (Figs 12 and 13), and complete recrystallization at 875 C., although considerable grain growth is exhibited by increasing the time of annealing at 875 C. to one half hour. (Fig. 14.) The melting point of these alloys containing over 5

per cent Cu is between 900 and 950 C. so that this annealing temperature is close to the fusion point.

The percentages of gold and copper in the next series of alloys investigated are given in Table 2.

TABLE 2.—PERCENTAGES OF GOLD AND COPPER

Alloy	Gold	Copper
1	80	20
2	75	25
3	70	30

These are classed in a different group because they exhibit a marked change in structure during annealing, possibly due to the formation of the compound AuCu at approximately 380 C. The alloys are melted under borax and cooled to the solidification temperature, then removed, quenched in water and subsequently worked and annealed at temperatures ranging from 200 to 850 C. The effect of annealing at 850 C. results in a structure similar to any solid solution, but the specimen annealed at 380 C. shows a very different type of structure, similar to the Widmanstätten structure in meteoric iron. (Fig. 15.) This change in crystalline structure has been considered to be due to the formation of the compound AuCu and has been described by Kurnakow and co-workers. This article indicated the formation of two metallic compounds of copper and gold, depending on the relative proportion of those metals, at a temperature of approximately 380 C. The composition corresponds to the atomic formulas, AuCu and $AuCu_3$, as shown by the complete temperature constitution diagram. (Fig. 16.)[5] The paper included incidentally the effect of a special heat treatment on the binary gold-copper alloys indicating that the physical properties of these compounds differ radically from the solid solutions formed at higher temperatures especially as regards microstructure, electrical properties and hardness.

When the alloy of the proper composition is cooled slowly, these compounds have an opportunity to form and the hardness is greatly increased. With rapid cooling, no such transformation takes place, and the alloy remains in its original state, which happens to be much softer. These effects are found only in alloys containing an appreciable amount of copper. The diagram and data are given in the foregoing publication showing the effect on Brinell hardness of heat treatment on the alloys of varying percentages of gold and copper, although

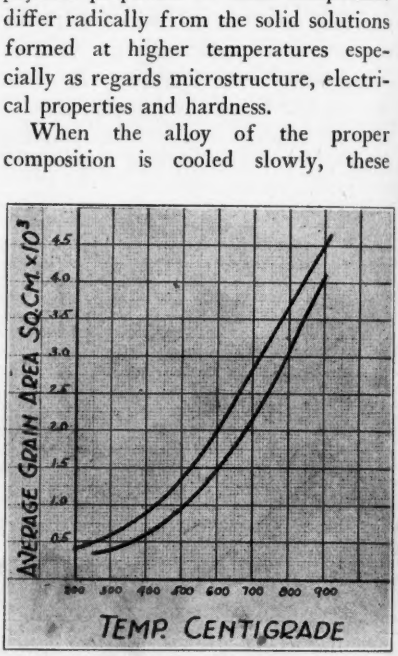

Fig. 9.—Graph showing grain area at various annealing temperatures.

5. Sedstrom (Ann. Physic) finds indications of only one compound, AuCu, which is the one here considered.

the article was written primarily for the purpose of demonstrating the existence of the two metallic compounds.

It seems to have been more or less generally understood by the dental profession, although by no means universally accepted, that the annealing of an alloy of gold and copper is accomplished by heating to redness and cooling rapidly, but no reference to the formation of solid transformation compounds is found in the dental literature, until the correct temperature or rate of cooling. This information regarding a method of heat treating, including a list of alloys that respond to such a treatment, is also available in the advertising sections of the dental journals. Owing to some misunderstanding concerning the probable cause of the increase of hardness, a number of claims have been made for certain alloys that are at least theoretically incorrect. It is the purpose of this investigation to determine any effect of heat treatment on these alloys as well as alloys that could theoretically be expected to respond to such treatment. Very few data now exist concerning any change in mechanical properties of gold alloys by heat treatment other than the effect on hardness. A number of photomicrographs and tests for tensile strength, etc., have been made by R. V. Williams,[7] and the recent articles by Souder

Fig. 10.—AuAgCuPt alloy; 6 per cent pt.; worked and annealed; heated at 875 C. for one-half hour. (× 30.)

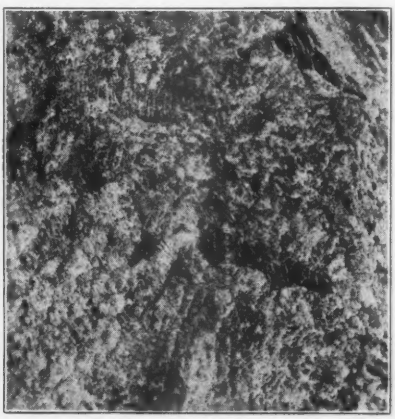

Fig. 11.—AuCuAg 22K.; worked. (× 30.)

Harder, referring to the work of Kurnakow, mentions this phenomenon and suggests the hardening of gold alloys containing copper by slow cooling.[6]

The dental manufacturers have recognized the possibility of hardening these alloys by proper heat treatment, and so-called tempering ovens are now on the market for subjecting them to

6. Harder, O. E.: J.A.D.A., 10: 869, (Sept.) 1923.

7. Williams, R. V.: Internat. J. Orthodontia, 9:569, 1923.

and Coleman[8] from the Bureau of Standards, give measurements on some of the proprietary wire alloys.

In dental practice, binary alloys of gold and copper are seldom used, as the color of such alloys renders them undesirable from an esthetic point of view, with the result that varying proportions of silver are almost universally added. Even the so-called 22-carat copper alloy contains about 3 per cent silver as a color modifier. In the more complex alloys, platinum, palladium and nickel are often used, while in solders some zinc is usually added.

Fig. 12.—AuCu; 10 per cent Cu; worked; annealed; heated at 540 C. (× 30.)

Fig. 13.—AuCu; 15 per cent Cu; worked; annealed; heated at 540 C. (× 30.)

The first alloys to be tested for hardness were a series of ternary alloys containing 91.7 per cent gold and varying proportions of copper and silver. The alloys were cast into a plaster mold and cooled rapidly, the general technic used in inlay casting being followed as nearly as possible, and then tested for hardness by the Brinell machine using a 10 mm. ball and load of 500 kg. for thirty seconds. These measurements were made for the purpose of obtaining an arbitrary standard in hardness of alloys used extensively in dental castings. They are known as the 22-carat copper or silver alloys, depending on the preponderance of one or the other of these two metals. Incidentally, no such hardness determinations on these alloys were available. The alloys were examined microscopically and showed in every case a series of mixed crystals with little indication of oxid pits or irregularities of any kind. The microscope revealed no essential difference in structure for the higher or lower percentage copper alloys, so no photomicrographs were taken. The hardness data appear in Table 3, including a comparative measurement on pure gold.

8. Souder, Wilmer: J.A.D.A., Physical Properties of Dental Materials, 12:509 (May) 1925; Coleman, R. L.: Physical Properties of Dental Materials (wrought gold alloys), ibid., p. 520.

TABLE 3.—HARDNESS DATA*

Au	Cu	Ag	Hardness
100.0	0.00	0.00	16.5
91.7	0.00	8.30	32.3
91.7	3.95	4.35	36.1
91.7	5.44	2.86	40.9
91.7	5.98	2.32	49.2
91.7	6.00	2.30	43.5
91.7	6.92	1.38	46.1
91.7	7.70	0.60	49.0
91.7	8.30	0.00	53.0

10 mm. ball; 500 kg. load; for 30 seconds.

* $H=\frac{500}{\pi D d}$: H = hardness, d = depth of impression, D = diameter of ball.

machines. The largest average error for any of the determinations was about 7.5 per cent for the 22-carat gold-copper alloy containing no silver. This may possibly be due to the uneven rate of quenching, which could not be standardized without extensive apparatus and control of the conditions under which the castings were prepared. The alloys containing less copper and a greater proportion of silver showed an average

Fig. 14.—AuCu; 10 per cent Cu; worked; annealed; heated at 875 C. for one-half hour. (× 30.)

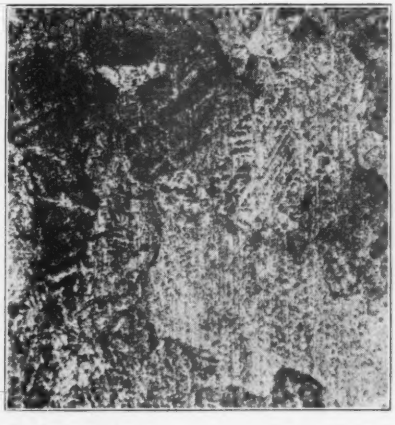

Fig. 15.—AuCu; 25 per cent Cu; cooled slowly and heated to 375 C. for one week. (× 150.)

This table shows that the hardness increases almost directly with the percentage of copper, indicating that the addition of the silver has little effect on this increase.

Each of these measurements is an average of from five to fifteen determinations made on different castings of the same composition. The measurement for pure gold given by Kurnakow is 18.6. The difference between this figure and ours may be due to experimental error or a slight variation in variation of less than 5 per cent, which is probably about the experimental error for a Brinell machine when such soft materials are being used.

The effect of heat treatment on the hardness of a 22-carat gold-copper alloy (91.66 per cent gold) was next determined. This was done by casting a bar approximately 0.4×1.2×5 cm. in an iron mold. The ingot was rapidly chilled under water and then polished on opposite surfaces to eliminate any rough places in the casting. The pol-

ished surfaces were etched with aqua regia to eliminate any surface hardening effect caused by polishing, and finally annealed for thirty minutes at dull red heat and quenched. This bar was tested in four places, on each side for hardness, using a Brinell machine as before, giving eight readings for hardness, on the annealed specimen. It was then placed in a furnace maintained at a temperature between 325

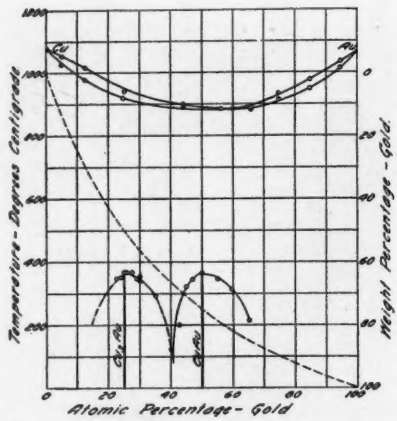

Fig. 16.—Temperature composition diagram of AuCu alloys. (After Harder.)

and 375 C., which is slightly below the maximum temperature of formation of the compounds so that conditions are favorable for the transformation to take place. This treatment was continued for one week, when the bar was again tested for hardness. Over sixteen measurements were made on the alloy before heat treatment, and eight measurements after. The average hardness for these determinations are as follows: after annealing, 53.5; after heat treatment, 60.6.

This shows an increase of about 13 per cent in the hardness after heat treatment of one week, and as the average error for each measurement is about 5 per cent, this increase is greater than the probable experimental error and indicates a small increase in hardness. Comparing these results with those obtained by Kurnakow, the agreement is favorable in respect to the change in hardness, but the individual results are lower in both cases. The only conclusion that can be drawn from these data is that a 22-carat gold-copper alloy that has been cast cannot be hardened to any great extent by heating to 327 C. for one week. This is probably due to the small copper content bringing the composition of the alloy just to the edge of the curve for the formation of the AuCu compound.

It seemed possible that, after such an alloy had been worked, as the ability for grain growth is known to increase, the ability for the formation of these compounds might also be greater. The same 22-carat alloy was then cast and rolled down about 5 per cent of its original thickness, polished, etched and annealed. This alloy was then tested for hardness and subsequently heated to 327 C. for one week. The results are as follows: hardness after rolling and annealing, 73.0; after rolling, annealing and heat treatment, 84.3.

Approximately, twenty-eight measurements were made on the annealed bar and eight after the heat treatment. This shows the increase in hardness due to the working of the metal and an increase of 15.4 per cent in hardness due to the heat treatment. It can thus be seen that, with a pure 22-carat AuCu alloy, a maximum increase of 13 to 15 per cent in hardness is all that could be

expected. As this alloy is seldom used in dental work without modification with silver or other metals, this maximum must be reduced in 22-carat alloys as the percentage of copper seems to be the deciding factor in such heat treatment. It seems highly improbable that a 22-carat alloy containing some metal in addition to the copper can be hardened appreciably by heat treatment.

The effect of the addition of other metals to the gold-copper alloy in respect to heat treatment has not been determined conclusively. Small additions of silver do not prevent the change in microscopic structure, and the Widmanstätten structure has been observed in alloys containing small percentages of silver, with 25 per cent copper and the remainder gold. From this evidence, it may be inferred that a small amount of silver in the alloy will not prevent hardening by heat treatment.

SUMMARY

1. Soldered alloys show a crystalline structure different from that of cast alloys, which indicates that the physical properties are not the same.

2. Soldering modifies the structure and physical properties of a cast alloy that has been swaged or heat treated.

3. Annealing is a function of temperature, time and composition of alloy.

4. The rate of cooling has little effect on alloys containing less than 4 per cent copper.

5. Heat treatment of 18-carat gold-copper alloy produces marked changes in crystalline structure.

6. Heat treatment of 22-carat AuCu alloys gives a maximum increase in hardness of 13 to 15 per cent.

7. Gold-copper-silver alloys containing less than 5 per cent copper (average 22-carat gold alloy) cannot be hardened appreciably by heat treatment.

LEGISLATION IN RELATION TO MOUTH HYGIENE*

By HARRIS R. C. WILSON, D.D.S., Cleveland, Ohio

HYGIENE is defined as "that branch of medical science which relates to the preservation and improvement of health." Therefore, mouth hygiene is "that branch of science which relates to the preservation and improvement of the health of the mouth." Let us keep clearly in mind this point of view of mouth hygiene; that is, the preservation and improvement of the health of the mouth.

About two decades ago, a considerable number of men in the dental profession became interested and active in the cause of "preventive dentistry," so called, owing to the efforts of a few enthusiasts who stressed the value of clean teeth. A few men found it agreeable to devote a large share of their time to prophylactic work; that is, the cleaning of the teeth for their clientele. This naturally brought about a condition in which a large number of men were, in a sense, forced to give a portion of their time to this activity.

A considerable part of the profession who were especially mechanically minded found the prophylactic work rather irksome, and owing to the custom of charging small fees for "cleaning teeth," they found it unremunerative. Therefore, the idea developed that it would be wise to train a group of people to perform this particular service. Much discussion ensued, both pro and con, in regard to developing a limited practice of dentistry. However, the need was so pressing that the states, one by one, passed laws making it possible for certain individuals to study for a limited number of weeks, usually thirty-two, then take the state board examination and be granted a license to practice "dental hygiene." Thus began the existence of a new profession, that of the "dental hygienist." At the present time, twenty-seven states and subdivisions of our country have on their books laws regulating the practice of "dental hygiene."

Although the laws are in substantial agreement throughout these states; there are certain distinctions that might be noted with advantage. The amount of preparation required for entering this profession ranges from no specific requirements to one or two years of high school, and, in several instances, four years of a first class high school. The latter seems at the present time to be the accepted standard for preliminary educational qualifications.

The amount of technical training required by the laws of the various states is usually one academic year, that is, from six to nine months, with one notable exception in which two academic years are required. During the past decade, ten schools for the training of dental hygienists have been developed in connection with recognized dental

*Read before the Section on Dental Legislation at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

institutions. We now have two or three thousand graduates from these schools.

Along with this development of the dental hygienist, there are certain concomitant factors that are worthy of our consideration. In practically ten years' time, some of our recognized dental educational institutions have increased their qualifications for graduation from three years after a high school course to six years beyond high school. The effect of raising the qualifications for the practice of dentistry has each time been to reduce the number of applicants for a brief period, after which the number seems to come back to practically normal. However, it is a fact that, even though the number of applicants for the practice of a profession remains fairly constant, the steady raising of standards is bound to increase the cost to the public of such highly trained service.

In looking forward a few years, one cannot but be impressed with the fact that we are likely to suffer from a shortage of personnel in the dental profession. While this will undoubtedly result in financial benefit to those members of the profession who are in active practice, it will also result in increased cost to the public and will necessitate such institutions as city health departments and boards of education paying higher salaries for dentists with six years of training. The salary schedule with the board of education in Cleveland for dentists at this time is from $1,950 to $3,300 per school year of thirty-eight weeks. The department of health pays from $2,400 to $3,200 for fifty-two weeks' work.

There are two fields of occupation open to the dental hygienist when she graduates from a school of "dental hygiene." One is to enter the office of a private practitioner and spend her time largely in caring for the adult patients, as well as some children, who make up the clientele of the dentist. The other opportunity, and the one in which we are interested, is that of working for children of school age in public schools and similar institutions. Dental hygienists in Cleveland Public Schools are paid from $1,100 to $1,800 per school year of thirty-eight weeks.

According to the present laws, the hygienists may do nothing of a practical nature other than to clean teeth. In no instance have we found the hygienist sufficiently trained in the theory and practice of teaching to be qualified to go into the class room and do a creditable piece of work with varying elementary school grades. It is one thing to discuss mouth hygiene with one of your own educational advantages and it is another thing to present the idea to a child 6 years of age; and it is still another thing to present these ideas to a group of children of from 12 to 16 years of age and hold their attention.

Mouth hygiene can never hope to accomplish its goal by simply filling teeth. This is a very necessary function, but it is not the ideal. We have never yet found a dentist who was trained in the theory and practice of teaching; nor do we anticipate that even a training of six years will qualify a dentist for this service; and it is logical and natural that he should *not* be trained for that service as that is not the intent of a dentist's training.

We cannot deny the fact that medicine and dentistry have throughout their entire existence been curative and restorative in nature, and we cannot expect that dentistry is going to change its attitude in a brief space of time.

Many of our profession earnestly desire to practice that which is preventive in nature, but our training has all been curative, restorative and corrective, not preventive.

The great field for mouth hygiene is prevention. We have stated that the dental hygienist with one year of training is not qualified to practice the ideal of her profession. By this, we do not mean in any way to criticize the effort of the ten schools of dental hygiene in this country. We feel that they have done well when we consider that their background has always been the education of a dentist and that they have had their student but thirty-two weeks. The point of view has been restorative, curative and corrective, and it is hard to change one's point of view, however earnestly one tries. We have also stated that the dentist, as he comes from the school, is not qualified for the work he is called on to do in the public schools for elementary school children. We grant that each advancement in educational requirements has prepared the world for and given it better and better dentistry. This being the situation, it seems that, after several years of experience, we have reason to suggest that a change be brought about in the training of persons to practice mouth hygiene as the need presents itself in a public school.

What are the qualifications necessary? First: Preliminary education of four years of high school, which should always include four years of science. This will mean that our candidate has had a little general science, a little biology, a year of chemistry and a year of elementary physics. With this foundation, we feel that the dental hygienist of the future should be given a more elaborate course in all the fundamental sciences that are now taught the medical and dental student, such as anatomy, physiology, histology, embryology, bacteriology, pathology and chemistry, including organic chemistry. In addition to these subjects, the dental hygienist of the future must be taught the chemistry of digestion. She must be taught the chemistry of foods. She must be taught the physiologic processes of assimulation and nutrition. She must, further, be taught the psychology of the child's mind. She must be taught the theory and practice of class room teaching that she may enter a class room of children, from kindergarten to junior high school, and be able to adapt herself and her vocabulary to the children before her. This requires no mean ability.

The dental hygienist of the future, in my opinion, must be able to make a careful examination and diagnosis of the condition of the child's mouth and should be able to make such corrections and restorations as are preventive in nature; that is, when the hygienist finds a tooth of defective formation, she should be able to recognize the condition and to remove the defective area, replacing it with a metal filling. The dental hygienist need know nothing of gold inlays, crowns, bridges, dental and oral surgery, prosthetics, radiography, orthodontia and such subjects, all of which belong to the field of dentistry, or the dental specialist. To put in one sentence my ideal for the dental hygienist would be to say that she should be qualified to do everything that is necessary in the line of mouth hygiene for a child in elementary school; both to teach and to practice.

No one here will for a moment think that a girl can be trained in thirty-two weeks to fulfil these require-

ments. It is my opinion that a course covering ninety-six weeks of hard work would qualify her to begin the practice of mouth hygiene. Some will have gathered that I am giving no attention to the girl who intends practicing her calling in the office of a dentist in private practice. Such is my intention, for I am not interested in that phase of the dental hygienist's work. My ideal is to train the dental hygienist for work in public schools, which I believe is to become her field of service.

Before undertaking to make any change in the various state laws relative to mouth hygiene, let us agree on the place the dental hygienist is to fill, and just what her education should be. I am aware that my ideas will meet with opposition from many sources and were that not true there would be no reason for presenting this paper here. My reason for accepting the invitation to appear on this program was that I might have the opportunity of discussing with those present the qualifications necessary for the practice of mouth hygiene for elementary school children.

SUMMARY

1. The increased standards for dentists will both reduce the number of dentists and increase the cost of their service.

2. Dentists at present are, and in the future undoubtedly will be, trained from the restorative, curative and corrective point of view.

3. Dental hygienists with one year of thirty-two weeks of training cannot be expected to qualify for all the service that should be rendered by them.

4. Dental hygienists for public school service should be trained to render all the service necessary for children of elementary school age from the health standpoint.

5. I suggest three years of thirty-two weeks each, ninety-six weeks; or, two years of forty-eight weeks each, as a proper training for dental hygienists.

6. When we have agreed on the proper training and the proper place of the dental hygienist, we are ready to advocate changes in our laws; but as I see it, there is no point in undertaking to change our laws until the two professions—dentistry and dental hygiene—are agreed as to the future of the calling of "dental hygiene."

DISCUSSION

W. F. Whalen, Peoria, Ill.: Legislation to establish the legal status of mouth hygiene is the first and paramount thing to be considered. That about twenty-seven states already have laws providing for the regulation of the practice of mouth hygiene is evidence of necessity for such service. The laws in many states make no provision to pay for the services of a physician, dentist or nurse in a school or in public institutions (I refer particularly to the state of Illinois), and still, by conducting the work of mouth hygiene under the department of teaching, we have been able to enlarge the activities in our state to reach all parts of our state. We have been successful, but if any taxpayer chose to do so, he might cause an injunction to be issued and stop the work. The activities of dental hygienists should be limited to schools and public institutions, and their operations should be confined to prophylaxis, examinations, lecturing, toothbrush drills and relief of pain in emergencies, but always under the supervision of a dentist. To provide that hygienists be permitted to fill teeth would be construed as practicing dentistry and therefore would prescribe a full course in dentistry. That in itself would frustrate the object in view, that of advancing the status of mouth health. The scope of the activities of the hygienist should be well defined and so outlined as to fit in with the practice of dentistry. I agree that the preliminary requirements should be a high school education, but I do not think that it is prac-

tical or necessary that, in addition, a hygienist be required to take a course of three years of thirty-two weeks each; nor do I think, though it might be very helpful, that a knowledge of anatomy, physiology, histology and other kindred sciences, other than those which could be given in a course of thirty-two weeks, would be necessary. The duties of a hygienist should be to teach mouth hygiene in such a manner as to cooperate with the dentists. When it is possible and necessary, there should be dental dispensaries in the schools, but none but licensed dentists should be placed in charge. In such dispensaries, work should be done for the children whose parents cannot afford to pay a dentist. It would be a serious mistake to permit hygienists to practice in dental offices, owing to the fact that many would perform operations other than those for which they were licensed.

F. O. Hetrick, Ottawa, Kan.: I am in accord with what Dr. Wilson advocates except that I doubt that the conclusions in his paper apply to a great many communities all over the country. I would object to the qualifications he puts in as a minimum and say, why not go a little farther and educate the hygienist to the status of the dentist? Whenever you put in a loophole and allow any of them to fill any kind of a cavity, you have opened up a field whose limits will surely be overstepped. At the present time, we are depending on the school nurses to make a diagnosis as to the need of fillings, and if they do, the patients are sent to their dentist. There should be a bill adopted in each state that is as nearly uniform as possible in its requirements. I believe that our research is showing that the most important problem is the proper feeding of children, beginning with prenatal feeding. From birth until about 1 year of age, mother's milk is all important. After that, the right kind of food for the growing infant should be prescribed, leafy vegetables and milk and very little meat. We have in our research activities some cases in which children 4 years of age do not know what candy is, nor do they know much about other sweets except as furnished in fruits. All these patients could not have unclean mouths or caries; therefore, the hygienist should be taught to be able to address mothers' meetings and parent-teacher associations, and educate the public in what is the proper diet for growing children. To my mind, this is the most important service that can be rendered. But I am against permitting the hygienist to fill teeth. With a proper diet, the filling of deciduous teeth would be eliminated. I am sure that the dental hygienist is going to be universally recognized.

MILITARY TRAINING IN DENTAL EDUCATION*

By ALFRED OWRE, D.M.D., M.D., C.M., B.A., F.A.C.D., Minneapolis, Minnesota

IDEALLY, I dare say everyone in this audience would be glad to see the necessity for military training of any sort disappear from the face of the earth. Civilized individuals greatly deplore the need for force; still more, for violence. In the last analysis, we are most of us pacifists. Those of us who are willing to look facts in the face are confronted by the unpalatable fact that mankind is born to a life of struggle. Up to the present time, as we are only too poignantly aware, such struggle has often been, at least between nations, to the death. We have always had war. While it is to be desired that we never have it again, it is extremely doubtful that we shall not.

I have been reading, in this connection, a most stimulating book by William Graham Sumner, "War and Other Essays." Mr. Sumner does not feel hopeful of a wholly peaceful future. "It is the competition of life" he writes " . . . which makes war, and that is why war has always existed and always will. It is in the conditions of human existence."

If he is right, the necessity for military training is at once established; and we are bound to admit that he has history on his side.

Later, in his book, Mr. Sumner says: "In the forum of reason and deliberation war never can be anything but a makeshift, to be regretted; it is the task of the statesman to find rational means to the same end. A statesman who proposes war as an instrumentality admits his incompetency; a politician who makes use of war as a counter in the game of parties is a criminal."

Yet, to quote him again, "War is like other evils, it must be met when it is unavoidable, and such gain as can be got from it must be won."

Mr. Sumner has a great deal more to say on this aspect of war. It is so admirable a presentation that I cannot resist the temptation to cull his essay further and present the parts most pertinent to our discussion.

> Men act from immediate and interested motives like these for which they have waged war, and the consequences come out of the forces which are set loose. The consequences may be advantageous or disadvantageous to men. The story of these acts and consequences makes up human history. So it has been with war. While men were fighting for glory and greed, for revenge and superstition, they were building human society. They were acquiring discipline and cohesion; they were learning cooperation, perseverance fortitude, and patience. Those are not savage virtues; they are products of education. War forms larger social units and produces states; of the North American Indians, those had the intensest feeling of unity who were the most warlike. The Netherlands forms a striking example in modern history of the weakness of a state which is inter-

*Read before the Section on Military Surgery at the Seventh International Dental Congress, Philadelphia, Aug. 23, 1926.

nally divided; the best historian of Dutch civilization tells us that the internal disintegration was always greatest in times of truce or of peace. There can be no doubt that the Germans of today owe their pre-eminence in industry and science to the fact that they are a highly disciplined nation. A Portuguese sociologist says that "War is the living fountain from which flows the entire society." If we fix our minds on the organic growth and organization of society, this assertion is not exaggerated. An American sociologist says that "in spite of the countless miseries which follow in its train, war has probably been the highest stimulus to all the faculties." The great conquests have destroyed what was effete and opened the way for what was viable. What appalls us, however, is the frightful waste of this process of evolution by war—waste of life and waste of capital. It is this waste which has made the evolution of civilization so slow. . . .

War also develops societal organization; it produces political institutions and classes. In the past these institutions and classes have been attended by oppression and by the exploitation of man by man; nevertheless, the more highly organized society has produced gains for all its members including the oppressed or their posterity. The social exploitation is not essential to the organization, and it may be prevented by better provisions. In long periods of peace the whole societal structure becomes fixed in its adjustments and the functions all run into routine. Vested interests get an established control; some classes secure privileges and establish precedents, while other classes form habits of acquiescence. Traditions acquire a sacred character and philosophical doctrines are taught in churches and schools which make existing customs seem to be the "eternal order of Nature." It becomes impossible to find a standing ground from which to attack abuses and organize reform. Such was the case in France in the eighteenth century. By war new social powers break their way and create a new order. . . .

War operates a rude and imperfect selection. Our Civil War may serve as an example; think of the public men who were set aside by it and of the others who were brought forward by it, and compare them in character and ideas. Think of the doctrines which were set aside as false, and of the others which were permanently stamped as heretical or orthodox. As a simple example, compare the position and authority of the president of the United States as it was before and as it has been since the Civil War. The Germans tell of the ruthless and cruel acts of Napoleon in Germany, and all that they say is true; but he did greater services to Germany than any other man who can be mentioned. He tore down the relics of mediaevalism and set the powers of the nation to some extent free from the fetters of tradition; we do not see what else could have done it. It took another war in 1870 to root out the traditional institutions and make way for the new ones. Of course the whole national life responded to this selection. The Roman state was a selfish and pitiless subjugation of all the rest of mankind. It was built on slavery, it cost inconceivable blood and tears, and it was a grand system of extortion and plunder, but it gave security and peace under which the productive powers of the provinces expanded and grew. The Roman state gave discipline and organization and it devised institutions; the modern world has inherited societal elements from it which are invaluable. One of the silliest enthusiasms which ever got control of the minds of a great body of men was the Crusades, but the Crusades initiated a breaking up of the stagnation of the Dark Ages and an emancipation of the social forces of Europe. They exerted a selective effect to destroy what was barbaric and deadening and to foster what had new hope in it by furnishing a stimulus to thought and knowledge.

If Mr. Sumner is right and our hopes of a more rational method of settling immediate problems is a will-o-the-wisp, it is an obvious necessity to follow his policy of making the best of the evil—to make of our military machine as nearly perfect an instrument as possible, with a variety of useful functions. If he is wrong—and I confess to unquenchable faith in the *ultimate* salvation of man through the intellect—the cold fact remains that we have a long way to go toward the millenium. Meanwhile, we must have an army standing by. In either case, it is

an obviously practical necessity to perfect and to utilize fully that army.

The Minneapolis Journal for July 10, 1926, had a pertinent editorial on this question entitled "For Pacifists to Think About."

Says the none too widely read Preamble introducing the Constitution of the United States:

"We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense . . . . do ordain and establish this Constitution for the United States of America."

Providing for the common defense was the fourth of six avowed purposes of the founders of this Government, one of the six needs that made essential the creation of any Federal Government at all.

Providing for the common defense, in this day and age, means something more than maintaining a navy, a small professional standing army, and some more or less obsolete harbor fortifications. The World War demonstrated that no great nation can defend itself adequately without a reserve based on at least the elementary military training of its younger men.

Having no such reserve when she entered the World War, the United States was forced to waste many precious months getting fully into action. Had this Nation, under these circumstances, been suddenly attacked by a world power, or combination of world powers, the result might have been highly calamitous for Uncle Sam. Indeed, it might have proved the finish of Uncle Sam.

Plainly, then, provision for the common defense, one of the six purposes of American constitutional government, today includes maintenance of a citizen reserve, at least of potential officers, trained in the rudiments of the military arts.

But every time the summer training camps for civilians and the Reserve Officers Training Corps in the universities, are so much as mentioned, the cry goes up from the pacifist ranks that we are turning peaceably inclined young Americans into bloodthirsty saber-clankers.

A few of the pacifists are secretly bent on keeping Uncle Sam stripped of proper defenses. More are fanatical radicals. All the rest, including important factions in numerous influential women's organizations and influential church organizations, are well meaning sentimentalists, misled by the specious twiddle-twaddle of small groups with treasonable axes to grind.

Most of this twiddle-twaddle is draped around the central argument that a trained reserve makes for militarism, chauvinism, national arrogance—that the ability to fight breeds a desire to fight, leads to national aggression.

All bosh! This country can embark on no military adventure without the consent of the elders. And so long as we are still paying billions of dollars in debts on a war that we won—not a war that we lost—there is going to be no assent by the elders to any war, save as a last, defensive resort.

The World War taught two lessons—that international conflict is disastrously costly, even to the winner; that modern wars are fought out between massed populations, rather than between professional standing armies.

The world talks about disarmament, but doesn't disarm. So long as this is the case, we are false to our own Constitution, unless we provide for the common defense, and providing for the common defense means, in this day, citizen training.

My point of view is admirably expressed by Benjamin Kidd in "Principles of Western Civilization." " . . . no efficiency," he writes, "in respect of the future would avail any type of society which did not also possess the power of being efficient in such conditions as exist in the present. If it were not able to hold its own in competition with other societies organized to obtain the highest potency in the present time, it must simply disappear from view in the stress of Evolution. . . . The most potent type of organized society in such conditions would be, beyond doubt, that in which every element and interest had been subordinated to the end of *military efficiency*."

To the end of military efficiency—not, observe, of militarism. Militarism in our civilization is a thing to be

utterly deplored—the Germans had that; but military efficiency is a thing we need a great deal of. "Militarism"—Mr. Sumner, again, defines it for us—"is pugnacity, preference for fighting methods, faith in violence, strenuosity, ruthlessness, cynical selfishness as far as one dare indulge it. It is entirely opposed to the American temper which has been developed by industrialism and which does not believe in fighting methods, although it recognizes the fact that men must fight sometimes, and that when the occasion comes they ought to fight with all their might. Militarism means one law for ourselves and another for everybody else; . . . Militarism is the neglect of rational motives and interests and the surrender of one's mind and will to whimsical points of vanity and anger."

Military efficiency is quite a different thing. It connotes order, obedience to law, effective organization, discipline. All of these are virtues found today in too small measure. Modern youth often lacks them all, especially discipline. I am old-fashioned enough to believe that a degree of this is essential to any well-rounded character; and it is my observation that, except for the rarest spirit—the genius, in fact—success in life is impossible without it. For this reason chiefly, I believe in any agency which gives students intelligent discipline. R. O. T. C. work intelligently conducted is one of the best of these. From the student's standpoint, whether he knows it or not, it is of great value. I am in favor of it in all colleges; but the dental student derives a peculiar benefit from such training. To succeed, a dentist must be attentive not to large things only but to everything. He cannot disregard details, for on perfection of detail depends the quality of his work. Military training, with its insistence on exactitude, on rightness in every detail, emphasizes the necessity for accuracy; it fortifies the principles his teachers have been laboring to establish.

The value of such training is manifest in other fields. Business has need of trained leaders. Mr. Sumner writes of this:

> The movement of the industrial organization . . . has brought out a great demand for men capable of managing great enterprises. Such have been called "captains of industry." The analogy with military leaders suggested by this name is not misleading. The great leaders in the development of the industrial organization need those talents of executive and administrative skill, power to command, courage, and fortitude, which were formerly called for in military affairs and scarcely anywhere else. The industrial army is also as dependent on its captains as a military body is on its generals. One of the worst features of the existing system is that the employes have a constant risk in their employer. If he is not competent to manage the business with success, they suffer with him. Capital also is dependent on the skill of the captain of industry for the certainty and magnitude of its profits. Under these circumstances there has been a great demand for men having the requisite ability for this function. As the organization has advanced, with more impersonal bonds of coherence and wider scope of operations, the value of this functionary has rapidly increased. The possession of the requisite ability is a natural monopoly. Consequently, all the conditions have concurred to give to those who possessed this monopoly excessive and constantly advancing rates of remuneration.

Emerson writes, on the subject of discipline, in "The Conduct of Life:" "We know that an army which can be confided in, may be formed by discipline; that by systematic discipline all men may be made heroes: Marshall Lannes said to a French officer,

'Know, Colonel, that none but a poltroon will boast that he never was afraid.' A great part of courage is the courage of having done the thing before. And, in all human action, those faculties will be strong which are used."

Another advantage of R. O. T. C. training in professional schools is that in time of war these highly trained and irreplaceable young men, representing the best of our manhood, are ready to function in their special fields. They are not thrown indiscriminately into the ranks, but they and their training are utilized to the full.

Recently, John C. Futrell, president of the University of Arkansas and of the National Association of State Universities, declared: "The University of Arkansas maintains a unit of the R. O. T. C. The work is a requirement for freshmen and sophomore students, and is optional with juniors and seniors. The University believes that military training, as given in the R. O. T. C. has a distinct educational value. It believes also that in the present condition of international relations there is a necessity that the United States should have available a large body of young men, well trained in the fundamentals of military art, who could, in time of war, be quickly converted into competent army officers."

From the standpoint of the state, student military training is equally to be commended. Nations are coming more and more to the policy of smaller standing armies. Great reliance in times of stress, therefore, must be placed on a trained body of civilians. The leaders, then as always, will be drawn chiefly from the educated class. It is obvious that they should be familiar with military discipline and strategy, that they should know at least the elements of the work they may need to perform.

From the other side, state universities and land-grant colleges are under a certain obligation to the federal government to train men in military tactics, that the government may have a trained body of men to call on in emergencies and times of stress. This is a consideration that should not be overlooked.

Even more than to know military tactics it is important that student reserves be physically able to do their part. Willingness is not enough. In this automobile-ridden age, the average townsman is so unaccustomed to physical exercise that he is unable to use his legs for an hour at a time. Military drill would be invaluable if it did no more than counteract this tendency to muscular decadence. The physical exercise furnished by military drill is one of its strongest claims to usefulness; it is of great significance to sedentary students. I believe that the army can be of the greatest service to the nation in developing and instilling the ideal of popular health. During the Great War, Edward Carpenter wrote in "The Healing of Nations:"

> But the said deficiency (in national physical stamina), which would be painfully illustrated by a serious crisis, is there equally in ordinary humdrum times of peace. The crippled and idiotic life which would bring disaster *then* is undermining our very existence *now*. Is it not time that a sensible nation should look to it that every one of its members, when adult, should at least be healthy, well-fed and well-grown, and that each should not only be decently developed in himself or herself, but should be capable of bearing a useful part of some kind in the life of the nation? Is it not time that the nation should place *first of all* on its pro-

gram the creation of capable and healthy citizens? Can a nation be really effective, really strong, really secure, without this?

Let us consider this now from the standpoint of the state. We have in history two outstanding examples of the military state—ancient Greece and modern Japan. The part played by the old Dorian military comradeship in Greek civilization is well known. Edward Carpenter writes of it in his "Intermediate Types Among Primitive Folk:" "The general institution of military comradeship, as we have described it, spread far and wide among the Greek peoples, and immense importance was attached to it. It became a sort of foundational element in their life, a publicly recognized source of political and social activity, an incentive to soldierly valour, and a bulwark of security to the state, an inspiration to art and literature, and a custom consecrated by religion and divine approval.

Mr. Carpenter, in the same book, writes delightfully of the Japanese institution:

> Of late years, much has been written about the Samurai; and their high tradition of chivalry, their spartan simplicity of life, their bravery, their loyalty, and dedication to the service of their country and its Mikado, are matters of common knowledge. This Order of Knighthood, as it may be called, was the ruling element of Japanese life during six or seven centuries, from 1200 A.D. onwards; and it was only in 1870 or so, with the introduction of the new Constitution, that it was dissolved—though its code of personal honor and of social service, under the name Bushido, still has a large, almost a national following. . . .
>
> Bushido, then, is the code of moral principles which the knights were required or instructed to observe. It is not a written code; at best, it consists of a few maxims handed down from mouth to mouth, or coming from the pen of some well-known warrior or savant.
>
> It was founded not on the creation of one brain, however able, or on the life of a single personage, however renowned. It was an organic growth of decades and centuries of military career.

Inazo Nitobe, in "Bushido," cites the common standard of conduct which actuates the Samurai, or Japanese knights. Among the virtues inculcated from childhood "with a kind of spartan insistence," he names "rectitude, justice, courage, endurance, and absolute readiness to die for duty."

Again quoting Mr. Carpenter:

> What the author of Bushido impresses on us with great force is that this ideal became the root of Japanese life. As the figure of the *gentleman*, the perfect knight *sans peur et sans reproche* emerged from our Feudal era, so the ideal of Bushido emerged from the feudal era of Japan. "What Japan was she owed to the Samuari; they were not only the flower of the nation, but the root as well . . . the innumerable avenues of popular amusement and instruction—the theaters, the story-tellers' booths, the preachers' dais, the musical recitations, the novels—have taken for their chief theme the stories of the Samurai. The peasants around the open fire in their huts never tire of repeating the achievements of Yoshitsune and his faithful retainer Benkei, or of the two brave Soga brothers; the dusky urchins listen with gaping mouths until the last stick burns out and the fire dies in its embers, still leaving their hearts aglow with the tale that is told. . . . Samurai grew to be the beau-ideal of the whole race. *As among flowers the cherry is queen, so among men the Samurai is lord.* Debarred from commercial pursuits the military class itself did not aid commerce; but there was no channel of human activity, no avenue of thought, which did not receive in some measure an impetus from Bushido. Intellectual and moral Japan was directly or indirectly the work of knighthood."

Mr. Carpenter, in "The Healing of Nations," has another significant contribution to this question. He writes:

> While protesting, as I have already done, against forced military service, it must still be admitted that the argument in favor of it

retains a certain validity: to the extent, namely, that every one owes a duty of some kind to his own people, that it is mean to accept all the advantages of citizenship—security, protection, settled conditions of life, and so forth—and still to refuse to make sacrifice for one's country in time of distress or danger. It is difficult, of course, for any one to trace all the threads and fibers which have worked themselves into his life from his homeland—as it is difficult for a child to trace all the qualities of blood that it owes to its mother; but there they are, and though some of these native inheritances and conditions may not really be to a man's liking, yet he can hardly refuse to acknowledge them, or to confess the debt of gratitude that he owes to the land of his birth. . . .

On the other hand, if we reject enforced militarism, are we to throw overboard the idea of "national service" altogether?

I think not. The way out is fairly clear and obvious. Let it be understood that there *is* such a thing as national or public service, to which (within the limits of individual conscience and capacity) everyone is bound to respond. Let it be understood that at a certain age, say from sixteen to eighteen (but the period would no doubt be a movable one) everyone, boy or girl, rich or poor shall go through a course of training fitting him or her for healthy and effective citizenship. This would include *first of all* bodily exercises and drill (needed by almost all, but especially in the present day by town workers), all sorts of scouting-work, familiarity with Nature, camp and outdoor life; then all kinds of elementary and necessary trades, like agriculture in some form or other, metal-work, wood-work, cloth-work, tailoring, bootmaking; then such things as rifle-shooting, ambulance-work, nursing, cookery, and so on. Let it be understood that *everyone*, male or female, rich or poor, learned or ignorant, is expected to qualify—not in the whole program, but first of all, and as far as humanly possible in the primary condition of physical health and development, and then after that in some one, at any rate, of the above-mentioned similar trades—so that in case of general need or distress he can do *something* of use. That would at least be an approach to a valuable and reasonable institution.

I have said enough, I think, to establish three points: (1) that military drill in colleges is of great benefit to students; (2) that it is an asset to the state; (3) that it can be made one of the strongest agencies in fostering the spirit of brotherly service throughout the nation.

DISCUSSION

James P. Harper, St. Louis, Mo.: Dr. Owre has done a real service, not only to this audience but also to the people at large by marshalling, in so effective and convincing a manner, the opinions of men who have thought deeply and philosophically on the subject of military training in our universities, with particular reference to dental schools. There is a necessity that these ideals become the commonplaces of American thought. The arguments in favor of military training might each be vulnerable when taken singly. The reason for this is that, in each of these arguments, there are involved diversities in point of view, any one of which might well be the subject of prolonged debate. It is becoming increasingly clear to us that, because of the infancy of our nation and the relatively novel character of its constitution, we are not as yet in full accord with regard to the very fundamentals of our Constitution. We had to fight a civil war to clear up in the minds of men the nature of our federation. Our legislation, of late, has, at times, sinned seriously against time-honored interpretations of the principles of our early legislative documents. It will take years so to mold public opinion that the fundamental formularies of our government will gradually mean the same thing for all of us. This is the psychologic situation. At present, controversies regarding militarism and pacifism are being waged. The same vacillation of approval and disapproval which is so marked a feature of the interpretations that have been given for Americanism also marks the controversies regarding military education. The arguments in favor of such education, as I have just hinted, may each be vulnerable, because each one of these arguments rests upon presuppositions which involve the individual's understanding of Americanism, not only intellectually but also in its emotional implications. When we group these argu-

ments regarding military training and allow them to lend strength to one another by their very alinement, no thinking person can refuse to recognize their cogency. To illustrate: Dr. Owre has just drawn a distinction between militarism and the military attitude. We may object to military training as far as it effects militarism, but surely no one will object to military training as far as it develops a military attitude; for we all recognize that "rectitude, justice, courage, the ability to bear trials and to make self sacrifice, even to the sacrifice of one's life" are sterling qualities of character the development of which is a consequence of military training, if the individual properly subjects himself to that influence. We need these qualities in our young Americans; we need these qualities particularly among our university students. It is a strange thing that those who, by their good fortune or the good fortune of their parents, are removed from the exigencies of life and put into the intellectual environment of our universities are handicapped by that very fact in the development of those strong characteristics which, after all, are the greatest possession of a man. Anything, therefore, that we can do to develop those characteristics in our country should be encouraged in every possible way. If the arguments against militarism derive their efficacy from the nature of the American spirit, and if the arguments for pacifism all seem to be derived from that spirit, and with all of these I am in hearty accord, there still remains the fact that military training, as Dr. Owre has pointed out, far from leading to militarism, can be made the most effective instrument in developing a military attitude toward life. Surely, respect for authority, obedience, cooperation, and sturdiness in the face of difficulties, all these are most desirable, and, this being granted, and it being granted, further, that military education can develop these qualities, the other numerous arguments, drawn from our international fears and ambitions, from economic threats and hopes, from social conditions, weak as they are, draw their strength from the fundamental soundness of the one fact that, through military training, we can develop a sturdier citizenship that cannot but strengthen the American nation. This is particularly needed among those who, sooner or later, will become the leaders of American thought and action, our American professional men. Dr. Owre has done us a great service by bringing together the arguments as they have been studied by minds who have given deep thought to their logical value, so that these various arguments may lend strength to each other and thus not fail in producing their maximum effect with a minimum of danger to individual ideals and liberties. To my mind there are two principles that must be kept sharply apart in our discussions of this matter. The first of these regards military training in our universities, taken purely as military training. The voice of authority has spoken. Those who are wise in the councils of our nation, those who are in authority have placed it as a duty upon the universities to cooperate with the government in a program of preparedness. "Ours not to question why." The government has extended to the universities the privilege of assisting in developing that which, to the government, is indispensable for the continuation, stability and safety of our democracy. We individuals may not agree with the methods that have been chosen, but it is certain that each one of us cannot have his own ideas carried out in the government of this nation. We must rely on those who, through the voice of the people, are responsible for the nation as a whole, and if our election of them to office implies the guarantee of our allegiance, and the promise of our obedience, then, when they have planned a course of action in which institutions must cooperate, there is no further room for argument, and the citizen's obedience is the only answer to the call of authority. Surely, the universities ought to be the first to respond to such a call, especially since, besides the privilege of serving their country, they have entrusted the greater privilege of training the leaders of the citizenry in the service of that country. As long as the authorities allow to remain in existence the present system of military training in our universities, it is little short of disloyalty for us to question the wisdom of that order. The second principle which must be kept in mind in this matter is that military training in dentistry has a distinctive and a necessary place in national defense. The statement has frequently been made that military dentistry does not differ from conventional dentistry; that to fill a cavity in a soldier's tooth is no different than to fill a cavity in a blacksmith's tooth. From one point of view, this is true. But carry the argument to its logical

conclusion: The sportsman on the hunt for quail fires his rifle; the soldier in the war for men fires his rifle; therefore, every good hunter must necessarily make a good soldier. To make a soldier out of a hunter means more than to teach him to take aim and to fire at command. We must super-add to the skill of the hunter the stamina and courage, the subordination, the obedience, the self-discipline which are more necessary even to make a soldier than the ability to pull the trigger of a rifle. To make a military dentist, you must super-add to the ability of a dentist to fill a cavity an understanding of military discipline and a spirit of cooperation, a knowledge of camp and barrack environment, a facility for seeing emergencies, a spirit of loyalty, obedience and self-restraint before that dentist can become a military dentist. And these things cannot be inculcated in an hour's talk. They require prolonged discipline. If you would understand what all this means, study the students from our dental schools who are sent to camp, and study them again when they leave camp. If you would see what this means, try to understand the organization of the United States Army with all its intricacies, its hierarchy of authority, its *esprit de corps*. For these reasons, I wish most heartily to endorse Dr. Owre's paper, and to express my hope that whatever may be the future of military training in our dental schools, as long as the present law stands, those dental schools which have had the privilege of training military dentists through the trust reposed in them by our government may not fall short of their trust, but may remain faithful to it. I hope, rather, that we may develop our appreciation of the purposes of such training, because, thereby, we shall not only be doing our bounden duty as citizens, but we shall also be elevating the profession of dentistry. For a profession develops as its motives develop, and, through military dentistry, we should be adding a motive—one of the greatest which can actuate a man for the development of dentistry and its greater service to mankind.

H. M. Semans, Columbus, Ohio: Dr. Owre has met the objections voiced in his own utterances and in the paragraphs quoted by him in a rational manner. Too often objectors to military training present among their arguments the point that such training develops a warlike attitude of mind and militaristic ideals. Dr. Owre has shown us that such is not the case. Preparedness, yes, to the nth degree, but a mind trained to thoughts of aggrandizement and the bluster of war, not at all. As he intimates, civilization must yet grow into a state of being unknown on this sphere. To talk and think of such a future happy state is all well enough, but while we hope and pray for such conditions, why not keep in mind that nations as well as individuals must be policed? Why should we not follow the methods of our best governed municipalities, who do not prepare simply for an occasional call to arms on the part of its citizenry when the unruly are to be dealt with, when traffic is congested, and our right to go about in an orderly manner is interfered with. Carefully selected, well-trained men, yes and women occasionally, are the most desirable citizens in such municipalities. In the United States, our military training will accomplish the same purpose, preparing men to be a credit in their professional service to their country and to the world at large. As Dr. Owre intimates, such military training most certainly has its place in the dental educational curriculum not only because it contributes to a mental, moral and physical fitness for the future, but also because it most certainly leads to a knowledge of a type of preparedness that augers well, not ill, for the future welfare of the world. As a member of one of the land-grant universities, whose obligations, as shown by Dr. Owre, include service to the nation in the way of preparedness, I can say that such military training in its various phases is beneficial to a large degree in developing military efficiency and does not, as those not well versed in the matter of such training believe, promote militarism.

DETERMINATION OF FUTURE TYPES OF CROWN AND BRIDGE WORK BY A SCIENTIFIC STUDY OF THE SUPPORTING TISSUES*

By T. A. HARDGROVE, D.D.S., Fond du Lac, Wisconsin

FROM a study of the human tissues, we know that they are undergoing constant destruction and repair. When we take up the study of the individual tissues, we find that destruction and repair take place in varying proportions. For instance, the red blood corpuscles are being destroyed at the rate of 25,000,000 every minute. This means that the bone marrow will have to produce one-tenth of all the body cells every day. On the other hand, Nature has endeavored to prepare some tissues so as to guard against the necessity of constant repair. In her effort to do this, she has evolved, out of the epithelial layer, the enamel, and has arranged the proportion of mineral matter in such a way as to resist destruction as much as possible. In the attempt to make a hard compact surface that would stand the strain of mastication, she has found it necessary practically to withhold from this tissue the nutrition that is so generously supplied to most other tissues. Any other bone-like substance in the body could not be exposed to similar conditions without undergoing immediate destruction. But the teeth, because of their increased proportion of mineral matter and the special arrangement of their cells, have served the purpose nobly.

If it were possible to control the endocrine activity of the different ductless glands that have to do with the production of teeth, there would not be the same demand for artificial substitutes. From some parts of Europe, there come to America people who have lived on the foods that maintain the proper balance and normal function of the endocrine system. These people are usually provided with a masticatory apparatus that will last throughout their natural life. Here in America, we are subjected to a changing diet, so that the endocrine balance is frequently disturbed and the endocrines do not adjust themselves readily nor are they as stable as in the European, who lives on a fixed diet, one that has been used by his ancestors for generations. Then, too, many of our people live inland and in districts where there are thyroid disturbances, so that the calcium metabolism is not so good as it would be if all of our people could come in contact with the climatic and other influences that produce normal thyroids and parathyroids. In proof of this, the children born in this country of parents of foreign birth do not have the same

*Read before the Section on Partial Denture Prosthesis (Including Crown and Bridge Work) at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 23, 1926.

quality of enamel that their parents have. Many times, the type of person who does not have decay will be subject to the tissue changes commonly known as pyorrhea, but this is much more easily controlled than is the decay to which the English speaking peoples are so prone.

As regards the problem of decay, there seems to be no immediate relief, as prophylaxis alone is unable to prevent the loss of teeth from decay. Since it has become necessary to replace lost teeth, various methods of so-called crown and bridge work have been advocated, and have been tried with varying degrees of success, and with many failures.

The future welfare of the people demands that the best possible substitute be furnished when the natural organs have been lost. In order to meet that demand, a more accurate and scientific study of the tissues involved in the restoration will have to be made in order to solve the problem of future crown and bridge work. We should endeavor to find out why certain types of work have been a success and others have been failures.

It is not merely a study of the mechanical methods involved, but also a study of the tissues that must tolerate the restoration, and of their relation to the remainder of the human economy. We must go back, as the pathologist does, to study in a scientific manner the structure, characteristics and habits of those tissues. This means that we must know their biologic nature and their tendencies and understand how tissues react to certain stimuli and irritations. Only upon a knowledge of the result of these influences on the tissues can we base our judgment and select the type of work best suited to the needs of the patient.

Working along these lines, we find that we must deal with facts, and not try to substitute imagination and an arbitrary idea of what we would like to have occur. In dealing with the actual facts, we know what is sure to occur as the result of a certain method of procedure. Someone has said that we must try to learn the unknown in order to understand the known. But the scientist must understand the known in order to reason what the unknown is likely to be.

It is not my intention to discuss the actual technic of crown and bridge work. A study of the problem clearly indicates that an understanding of the tissues is the essential requirement. A crown or bridge can render no more service than it can exact from the tissues on which it must depend for its support. As between fixed and removable bridge work or partial dentures, the greater service has been delivered by and can be expected from the so-called fixed bridge.

In a detailed study of these tissues, we find that they are classified as sustentative or as supporting tissues, which give support to the different systems and parts of the human body. The sustentative system includes the bones, cartilage, connective tissues, such as tendons, ligaments and spongy and elastic connective tissues, and adipose tissue for the storage of fat. In the animal scale, we find the sustentative tissues most highly developed in the vertebrate division, and man is the type with which we are most concerned.

There are several types of attachments of the teeth in the animal scale, but time will not permit a discussion of that factor. The type of attachment

with which we are concerned is that which holds the teeth in sockets, known as the implantation type.

Biologically speaking, differentiation always involves specialization, and specialization always means a limitation of function and is always accompanied by a division of labor. By specialization, a limitation of function to one or few processes is meant. By division of labor, as it is interpreted in terms of biology, we mean the assigning, so to speak, of various functions among cells or groups of cells. The most obvious examples of this are found in animals of complex organization, although it does occur in the simple cells and organisms.

At the end of gastrulation, we find two germinal layers, the endoderm and the ectoderm. Later, there is developed from these a third layer, known as the mesoderm. The sustentative tissues are to a large extent developed from the mesoderm. Not only are the tissues that are directly involved derived from the mesoderm; the blood itself can be viewed, not as a sustentative tissue, but as a sustaining one, by virtue of its nutrition; and it too is derived from the mesoderm.

These tissues, which have been differentiated and their function limited to certain labor by the specialization referred to, are selected by Nature to render a certain service. They are, biologically speaking, endowed with special properties, so that they can be relied on to deliver that special type of service when they reach their maturity. They are, biologically and anatomically, prepared for and function physiologically to meet certain unusual demands. Such tissues are known as specialized tissues.

Nature has arranged the different cells and the protoplasm of the different cells entering into the composition of these tissues and has regulated the endocrine balance in such a way that certain hormones enable these tissues to perform a certain high type of service, or even an extension of that service, which would not be expected under ordinary circumstances. She has laid down the rule that these special functions will be performed only in proportion to the development of the tissues for that purpose.

In the group of sustentative tissues, an outstanding tissue having these qualities is the alveolar periosteum or peridental membrane. This is a complex and highly organized tissue endowed with an ability to support th teeth in the act of mastication, even beyond what might ordinarily be expected of it. It is a tissue of periosteal characteristics on the side toward the bone and a modified periosteum, taking on the characteristics of the pericementum on the pericemental side of the membrane. It is one tissue and cannot be divided. Laced to it and within the sockets are the teeth, held in position by fibers passing from the bone to the cementum. These fibers really form a suspensory ligament and should be regarded in that light. The fibers are thin where they are attached to the cementum and thicken as they pass away from it. They are highly complex and specialized where they wind over and are lost in the periosteum and connective tissue at the cervix.

That brings us to an important consideration. Tissues of a complex and highly specialized nature are easily injured by any irritation or trauma that is abnormal for that type of tissue. The more highly a tissue is organized, the more easily it is injured or lost.

It is characteristic of the repair of special tissue of mixed character that the main tissue only is regenerated, but the peridental tissue is without the ability to regenerate itself. Dr. F. B. Noyes of Chicago, as well as the late Dr. Black, expressed a belief that, in the course of some experimentation, he might have witnessed reproduction of the peridental membrane had not something interfered with the experiment.

Nobody has been able to produce the peridental membrane, and if it were produced, it probably would not have the same specialization of functional ability as has the natural peridental tissue. In my experience, it is impossible to reproduce a normal peridental tissue, and if an attempt is made at reproduction by Nature, it occurs by means of a numerical hypertrophy or hyperplasia of the cells in activity which must result in a failure. Thus, the peridental membrane has not the ability to replace itself in detail, and if the regeneration of the peridental membrane were possible, it would probably not have the same characteristics as the original peridental membrane. That may be the reason why implanted teeth are never a great success.

Therefore, to a large extent, the success of crown and bridge work depends on the peridental tissues. These tissues must be accorded paramount consideration in the selection of the type of restoration to be used. Any type of crown and bridge work that does not depend on that membrane for its support is demanding a service from some other tissue which Nature has never prepared it to render.

There are certain reasons why a fixed bridge is apt to be more successful than a removable one. In the first place, the highly specialized and sensitive tissue at the cervix of the teeth can be protected by a fixed bridge, as it is not apt, if properly made, to irritate the tissue at that point. That fact has been taken into account in the United States by such men as Dr. Goslee and Dr. Akers, who make their bridge work in such a way that it does not come in contact with that tissue.

A fixed bridge does not depend on the periosteum for its support as does much of the removable or partial plate type of work, but delivers the stress directly to the peridental membrane. The peridental membrane is protected against traumatism by a proper anatomic formation of the cusps of teeth that controls and limits trauma to the physiologic possibilities of that membrane. It can be relied on to meet all the demands of mastication, and, when necessary, in the case of a bridge attachment, a single tooth can endure more than would be normally exacted of it, because it is fortified by its ability to call on the suprarenal hormone to enrich it with an abundant blood supply. When necessary, it will produce a simple adaptive hypertrophy to enable it to meet the new demand.

Hart J. Goslee of Chicago, who has influenced so much the progress of American dentistry, has called attention to this fact. The explanation of it is found in the experiments carried out by Albert N. Crosby, in quoting Professor Cannon of Harvard and T. R. Elliott, who, in their study of the suprarenal glands, brought to light a wonderful hormone mechanism. When we are about to make a supreme bodily effort, the muscles must be supplied with an abundance of oxygen and blood sugar, the fuel of muscle energy. At the beginning of the increased output of energy, the suprarenal glands are

excited by messages passed to them by the central nervous system. They throw a hormone, epinephrin, into the circulating blood, which has a double effect. Epinephrin acts on the flood gates of the circulation so that a greater blood supply is furnished to the muscles. At the same time, it so acts on the liver that the blood circulating through that organ becomes laden with blood sugar. Here, we obtain a glimpse of the neat and effective manner in which hormones are utilized in the economy of the living cell. It is that influence that is called in and that supplies the extra endurance that Dr. Goslee spoke of, and the local tissue resistance that prevails when a tooth is taxed beyond its normal capacity to carry bridges.

CONCLUSIONS

1. There must be special tissues to do special work.
2. Such tissue has a limited function.
3. This type of tissue is easily destroyed and not easily repaired, and, in the case of the peridental membrane, is not repaired in detail at all.
4. The periosteum was never developed to do the peridental type of work.
5. All bridge work should be made so as to protect that special tissue.
6. Fixed bridge work, properly made, with proper cusps, will prevent trauma to the peridental tissue.
7. A richer blood supply, and, when necessary, an adaptive hypertrophy, can and does take place to take care of the extra work.
8. This balance occurs as a result of hormone activity.
9. The future success of artificial bridges will depend, as in the past, on the peridental membrane.
10. There will always be a need for removable bridge work, partial plates and other than fixed types; and the service that they render will be the best that can be expected when the peridental membrane is not functioning for their support.

DISCUSSION

William Hopkinson, Milwaukee, Wis: A study of the tissues in which the teeth are imbedded, also the relation and reaction to the forces of mastication, as presented by Dr. Hardgrove in his paper, brings forcibly to our attention the fact that, no matter what the type of bridge work may be, its success will depend entirely on the integrity of the surrounding tissues. In our attempt to replace the lost organs of mastication we believe it to be absolutely necessary to know the latest teachings of histology, pathology and dental anatomy. Dr. Hardgrove calls our attention to Nature's method in selecting the right kind of tissues in the formation of the different parts of the body, including the teeth, according to their function. If Nature is not interfered with, she builds and builds well. She arranges the different types of tissues with their living parts, the cells, in a most wonderful way, just where they can best accomplish the work they have to do. As an example: epithelial tissue differs in its character according to the needs of the different organs. On the outer surface of the body, the stratified squamous epithelium is always present where protection is of most importance. The ciliated columnar type of epithelium is most important when it is necessary to prevent foreign substances entering in the respiratory tract. Muscular tissue is needed for expansion and contraction of the different organs. The glandular tissue is needed where secretion and excretion is demanded. This is also true with the teeth and tissues taking part in the function of mastication. Every part is wonderfully adjusted structurally and functionally to make an efficient masticating organ. In describing the functions and structures of teeth, it will be seen immediately that the main function of the root of the tooth is to secure for the tooth a firm attachment by the peridental

membrane with the alveolar process of the jaw. Here a mechanical attachment is of great importance, while the preception of nervous impulses is of almost no importance. Any dentist, whether a specialist in bridgework or a general practitioner, will agree that the two most important tissues of the teeth to him are the cementum and the peridental membrane. Now one of the vital points in the discussion of this paper is: Do teeth normally move in function, and is this function retarded in fixed bridge work, or is it benefited by the use of movable removable bridge work? In an attempt to answer, without depreciating the value of either of these types of bridge work, I cannot do better than to quote from one of our most prominent writers on dental histology, Arthur Hopewell-Smith: "Normal cementum measures in width a little more than the edge of a safety-razor blade. I have repeatedly measured it with the stage and ocular micrometer of the microscope. Its dimensions vary from zero to one hundredth of an inch. As far as the peridental membrane is concerned, this is the analog and the homolog of the periosteum of bony tissue. It should be properly called the alveolar dental periosteum, not the dental ligament nor pericementum, nor in the anatomical sense even the peridental membrane, because it is equally distributed over the inner surface of each socket as well as over the surface of the root of each tooth. Roughly it measures normally twice the width of the cementum, or about one-fiftieth of an inch or less, not including the numerous bays or recesses on the surface of the alveolar bone. The bone at the apical foramen completely surrounds the termination of the root of the tooth. Normally in man there is no space and no 'indifferent tissue' in this region." At another time, the same author makes the following definite statement: "Contrary to a widespread belief, there is no actual movement of a healthy, normal tooth in its healthy, normal socket. The articulation of the teeth with the alveolar processes of the maxillae and mandible is a unique variety of the anatomical condition known as synarthrosis—viz.: a firm, fixed, immovable joint. Now, the synarthroses include the sutures by which the cranial bones are connected. They are variously termed the frontal suture, the lambdoid suture, etc. Where the bones are united so intimately—a small amount of fibrous connective tissue only intervening—no appreciative movement of any kind can possibly take place. Several movements appear wrongly to be ascribed to the teeth in their sockets; one in the vertical direction occurring, so it is said, during occlusion; another in a mesiodistal direction; a third in a buccolingual direction. None of these supposed movements exists in normal attachments of teeth and bone. When a tooth is loose there is more or less disease of the alveolar dental periosteum and alveolar bone." There are many points in this paper that might be discussed with profit to all of us. I wish to emphasize that a thorough examination of the supporting tissues should be made, with a correct histopathologic diagnosis, and that the tissues be placed in a healthy condition before any type of bridge work is inserted.

Dr. Hardgrove (closing): The comparison of the joint between the tooth and its alveolar socket and the sutures of the cranial bone is not a fair one, because the sutures of the cranium interdigitate in different directions and are designed to prevent movement. Reference is made to functional movement, which, of course, would be exaggerated if the tissue is inflamed or pathologic. The peridental membrane is a dual purpose membrane, one important function being to absorb shock and thus to prevent injury to the bony sockets. "Alveolar dental periosteum" is a correct term as far as location is concerned, but does not explain in any relation the function of the tissue. When Nature developed the peridental tissue, even though it is very thin she intended to have sufficient movement to prevent shock and stand the stress of mastication. The main thesis of this paper is not the question as to whether or not teeth move in function, but the facts that there is special tissue developed to do certain work in the human economy; the peridental tissue is one of these tissues; it is a tissue easily destroyed because of its specialization, and it is not likely that it will undergo repair.

PHYSICAL EXAMINATION OF PATIENTS BEFORE EXTRACTION OF TEETH UNDER GENERAL ANESTHESIA*

By LAWRENCE CURTIS, A.B., D.D.S., M.D., Philadelphia, Pennsylvania

THE general anesthetics commonly employed for the extraction of the teeth are nitrous oxid and oxygen, and ether. Other agents are employed, such as chloroform, "somnoform" and ethyl chlorid, but they are in the minority. It is not the purpose of this paper to consider the pros or cons of this or that general anesthetic, except where there is a direct bearing on the condition of the patient, and one or another anesthetic is contraindicated.

Ether is chosen for certain cases—impactions, difficult extractions involving surgical measures, operations of long duration, etc.—and such cases should always be cared for in a hospital. All high grade hospitals demand a thorough physical examination of all patients who are to be subjected to a general anesthetic, regardless of the type of operation, with especial reference to the condition of the heart, lungs, kidneys and cardiovascular system in general. Such examinations are made by the resident physician, as a rule.

For the great majority of extractions of the teeth, nitrous oxid and oxygen is employed, and the work is not done as a rule in a hospital, but in the office in the dental chair.

The belief is unfortunately prevalent that nitrous oxid and oxygen is a "fool-proof" anesthetic. While it undoubtedly is the safest inhalation anesthetic known at the present time, and deaths, when it is employed, are rare, particularly in short operations, to assume it to be absolutely safe is both dangerous and wrong. Deaths have occurred during the extraction of teeth under nitrous oxid and oxygen in the dental chair. The busy exodontist is too often loath to consider his patient from any angle except that of the tooth which is to come out. He says that he hasn't the time; but some day, when something has gone wrong, and it is too late, he may wish he had taken a few short moments to look over his patient.

Any and all patients, old and young, have a right to some sort of physical examination before taking a general anesthetic. It is unnecessary, in short operations, to go into detail, but a cursory examination of every patient should be made. Some dentists routinely apply the stethoscope to the chest over the cardiac region before the anesthetic is administered. No examination of the chest is worth anything unless the patient is stripped to the waist, so the use of a stethoscope through the clothing

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may impress the patient with the thoroughness and care of the operator, but as a scientific procedure, is quite useless. We can learn a good deal about the physical status of our patients by inspection, by looking at them with a keen eye.

First of all, we must consider the habitus of the patient—the general appearance and physique—whether or not he looks healthy. The thin, emaciated person, the anemic, pallid patient, must excite our suspicion of the possibility of cardiac or pulmonary disease. The obese patient is not such a good subject as the thinner type, but obesity *per se* is no contraindication to a general anesthetic. Pregnancy, almost up to full term does not contraindicate the use of nitrous oxid and oxygen, given with care, for short operations, but other than emergency extractions should be deferred, if possible, during the final months. Nor does menstruation or lactation, but it should be borne in mind that most women, during the menstrual period, are in an abnormal state of nervous tension, easily excited and subject to shock. It is therefore best to defer all but emergency operations until the period is over. You will often be asked such pertinent questions, and be expected to answer them.

The highly nervous individual, full of fear, should be handled with exceptional gentleness before administration of the anesthetic. Profound nervous shock may be otherwise produced and may lead to serious consequences. This is especially true of high strung children and nervous women.

Any agent or condition which embarrasses the respiratory apparatus should receive our attention. Corsets, which are still worn occasionally, should be loosened, as should tight collars and collar bands, etc. Swellings beneath the mandible may embarrass the respiration, particularly that associated with Ludwig's angina. Labored rapid breathing and inability to hold the breath more than a few seconds are signs not to be ignored. Heart disease, whether valvular or otherwise, is not a contraindication to nitrous oxid and oxygen anesthesia unless definite signs of decompensation are present, such as swollen ankles, labored breathing, and cyanosis of lips and finger tips, etc. Pulmonary tuberculosis does not contraindicate the use of nitrous oxid and oxygen, but does contraindicate the use of ether, for the latter may light up a smouldering lesion in the lung. Urinalysis is not necessary for short operations. The aged take nitrous oxid and oxygen well, but one should always bear in mind the possibility of arteriosclerosis and an attendant stroke of apoplexy. These accidents are rare, but do occasionally occur.

The pulse should always be taken into consideration. The rate is not so important, for nearly every patient has an accelerated pulse due to anticipation of coming events. The rhythm and force, the important factors, are, of course, best determined by palpation of the radial artery at the wrist.

Nitrous oxid and oxygen probably increases the blood pressure; consequently, the patient with puffiness under the eyes and edema of the extremities, or with outstanding tortuous arteries over the temporal region, bespeaking possible nephritis or arteriosclerosis with high blood pressure, is to be given particular thought.

Every dentist should know how to take the blood pressure and should understand its significance. The patient with a high pressure is usually under the

care of a physician, who makes the fact known to the exodontist and considers the advisability of employing a general anesthetic; but this is not always the case and is not a safe assumption. A few moments spent with the patient in a determination of a suspected high blood pressure, with subsequent consultation with a physician, may prevent a serious catastrophe.

The epileptic or the individual suffering with epileptiform attacks has, of course, an unstable nervous mechanism, but general anesthetics are not contraindicated, as a rule, in these cases.

A diabetic condition calls for nitrous oxid and oxygen, if possible, when any general anesthetic is used.

Finally, the patient should be questioned about certain possible habits. There will be no offense if the questioner is dignified and careful in the framing of the questions. It must be borne in mind that the chronic alcoholic is capable of great strength when under the influence of a general anesthetic, and may do damage to life and property. When he regains consciousness, he is full of remorse, but a few questions would have prevented the trouble. Likewise, the man who takes but an occasional drink, but who, before coming to the exodontist, has fortified himself with a substantial draught, is apt to give trouble under the anesthetic.

The morphin addict, with constricted (pin point) pupil, pasty complexion and shifty glance requires little of the anesthetic. His respiratory apparatus is already depressed so that his breathing will be abnormal. The respiratory depression of the excessive smoker must not be overlooked.

We owe our patients thorough, intelligent service, and should give it to them, to the best of our ability, at all times.

"To bring a living being to that borderland in which life in so many respects so simulates death, should at no time be a fool's occupation."

Medical Arts Bldg.

CAVITY PREPARATION FOR THE GOLD FILLING*

By J. V. CONZETT, D.Sc., D.D.S., F.A.C.D., Dubuque, Iowa

CAVITY preparation is fundamental to all operations for the filling of cavities in the teeth. No matter how well the filling may be introduced into the cavity, or how perfectly the shape of the tooth may be restored by it, if the cavity has not been prepared along scientific lines, the filling will fail sooner or later.

The present knowledge of cavity preparation is an evolution that has been the work of countless operators of merit in the past, but it remained for G. V. Black to correlate and systematize the efforts of the great men that had gone before, and to add to their work the results of his researches, finally giving to the profession the present system of operative dentistry which has the honor of bearing his name. In the present treatise, I shall follow closely the system which he has elaborated, only departing therefrom in presenting the various problems in the light of my own experience.

Definite results demand definite methods, and a consistent sequence of successes cannot result from haphazard manners of procedure. Therefore, we will follow the outline laid down by Dr. Black as our method of making ready the cavity for the reception of the gold foil filling: (1) obtain the required outline form; (2) obtain the required resistance form; (3) obtain the required retention form; (4) obtain the required convenience form; (5) remove any remaining carious dentin; (6) finish the enamel wall; (7) make the toilet of the cavity. The outline form comprehends extension for prevention and the esthetic form.

We know that there are certain areas on the surfaces of the teeth that are more susceptible to the onset of caries than are others. These are called the areas of susceptibility, in contradistinction to the areas of comparative immunity. In the making of a cavity, it is required that the margins of the cavity be carried out of the susceptible areas and into the areas of comparative immunity to decay. If this is not done and the margin of the finished filling is in the area of susceptibility, there is a great probability of the recurrence of decay at that point. The areas of susceptibility are all imperfect sulci and pits, making for pits and fissures in the surface of the teeth that will harbor the organisms that cause decay, and all smooth surfaces that are not kept clean by the friction of the bolus in mastication, or by the movements of the tongue and lips. These areas are those between the teeth above the free margin of the gum and below the contact point, and the gingival thirds of bell-shaped crowns.

The esthetic form is that which is

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given to the cavity which will in the largest degree tend to maintain the harmony of the filling with the form of the tooth and the avoidance of acute angles within the range of vision. The resistance form is that which we give to the cavity that will best serve to resist the thrust forces which fall upon the finished filling. The retention form is that which we give to the cavity which will best tend to resist the forces having a tendency to pull the filling out of the cavity. The convenience form is that which we give to the cavity which will best enable us to introduce the filling material perfectly into adaptation with the walls of the cavity, and thus exclude moisture.

The removal of any remaining carious dentin is a prerequisite of success, for any decay remaining in the cavity under the finished filling will be a menace to the permanency of the filling, and a great danger to the life of the pulp.

The finishing of the enamel wall comprehends the removal of any disintegrated enamel rods and the beveling of the cavosurface angle.

The toilet of the cavity is the cleansing of the cavity of all débris caused by the cutting of the tooth structure and the removal of the decay. No chips or loose substances of any sort should be allowed to remain in the cavity and its surface should be scrupulously clean in every respect.

For the purposes of study, we divide cavities into five classes: Class I. Cavities having their beginnings in the defects of tooth structure as fissure and pit cavities. Class II. Cavities having their beginnings in the proximate surfaces of bicuspids and molars. Class III. Cavities having their beginnings in the proximate surfaces of incisors and cuspids not involving the angle. Class IV. Cavities having their beginning in the proximate surfaces of incisors and cuspids involving the angle. Class V. Cavities having their beginning in the gingival surfaces of any of the teeth.

In Class I cavities, the carious process is in the defect caused by the failure of the union of the enamel plates. It is always advisable to fill these cavities, as indeed any cavity, at the earliest opportunity. The fissure is entered by using a cross-cut fissure bur No. 702 and cutting the fissure to its entire length. The outline form here demands the cutting of the fissure until the margin of the cavity lies in smooth territory; for if any of the fissure is left, it will cause a rough margin for the retention of food débris and micro-organisms, and there will probably be a recurrence of decay around the filling. No matter how small may be the initial penetration of decay, the fissure must be cut out in its entirety to insure success. In children's teeth, when decay is just beginning and foil is to be used, it is well to make the cavity very narrow and fill it with cohesive foil; but, in the adult tooth, we prefer to widen the cavity, making the outline form in the general form of a maltese cross of considerable width; this for the purpose of filling the cavity with the noncohesive foil, which could not be advantageously used in a narrow cavity. The resistance form is obtained by making a flat pulpal wall with an inverted cone bur No. 37, or 39 if the width of the cavity permits it. The retentive form is also satisfied by the flat seat and, in addition to that, the axial walls are to be made parallel all around the cavity. In the making

of a cavity for the gold foil filling, it is permissible to make a slight undercut at the axiopulpal angles such as would be made by allowing the shank of the bur to parallel the axial wall and the blade to sink into the axial wall at the pulpal angle to the depth of half the diameter of the bur. This will make a slight undercut, but one sufficient for the purpose.

In this class, there is little need for extension for convenience, for the cavities are usually in convenient territory and the cutting of the outline form into immune territory is usually sufficient for convenience. If the filling is to be made of cohesive gold foil, it will be well not to make the mesial axial wall too acute but allow the wall to incline slightly distally as it nears the pulpal wall in order that the axiopulpal angle may be easily reached by the plugger point. We cannot condense gold around a corner, and it is always necessary to form any cavity in such a manner that the plugger point may be able to reach every corner of the cavity. If the cavity in the occlusal surface of a molar or bicuspid is to be filled with a noncohesive gold foil, the angles may be made as acute as possible in the mesial aspect; for the noncohesive cylinders can be condensed into these angles by the wedge process which is used to condense noncohesive foil fillings.

Any remaining decay should now be removed. It frequently happens that the removal of this remaining decay makes a deeper portion in the center of the cavity than that around the periphery, but if the general depth is sufficient, it is not advisable to deepen the rest of the cavity to conform with the depth obtained by the removal of the remaining carious portion. No attention should be paid to the discrepancy in the flatness of the pulpal seat, the cavity being filled as it is.

The finishing of the enamel wall is accomplished with a sharp chisel, and the margins are beveled all around. In studying the splendid work of Dr. Noyes in which he demonstrates the arrangement of the enamel rods in their relation to the dentin and the manner in which they stand on the dentin in the various aspects of the tooth, we find that the rods, in general, conform to the shape of the dentin, standing at right angles to it all around the tooth; but there are exceptions, and it is these exceptions that must be carefully studied by the operative dentist, if he wishes to make his cavosurface angle of the strongest and most resistant shape. At the cemento-enamel junction, the enamel rods incline toward the root to some extent, and then, as they approach the middle third of the tooth, they turn slightly, so that, at this point, they are at right angles to the dentin. Again, pursuing their course toward the crest of the cusp, they incline the other way so that the rods are pointing occlusally until, at the crest of the cusp, they are again at right angles to the crest of the dentinal cusp. Going over the cusp and down toward the sulcus, they again incline toward the center of the tooth until at the sulcus, or fissure, if it so be, the inclination of the rods is such that a cut straight through them at this point will not leave any short rods at the surface. The nearer the sulcus, fissure or pit that the cavosurface angle is made, the less need is there for a cavosurface angle, but the farther away from these points, as the cavity progresses toward the crest of the cusp, the

greater must be the bevel of the angle to protect the enamel rods.

The bevel should be at least half the width of the enamel and should always be made with a chisel or sharp instrument of some kind, and never with a stone or disk. A stone or disk may be allowable on the margin for an inlay but not for a foil filling; for, as has been repeatedly demonstrated, it is a great deal more difficult to adapt gold foil perfectly to a polished surface than it is to a planed one.

The toilet of the cavity is now made by clearing the cavity of all chips and operative débris, and the cavity is ready for the filling.

Class II cavities have their beginnings on the proximate surfaces of the teeth just gingivally to the contact point. The cavity is made with a step in the occlusal surface, and the outline form will be on the occlusal and proximate surfaces. The cavity is commenced by opening into a pit or fissure on the occlusal surface with a cross-cut fissure bur and cutting toward the marginal ridge. If the bur falls into the cavity in the proximate surface before the ridge is broken down, the bur can be drawn up toward the occlusal surface until the enamel on the ridge is undermined and broken down. The bur will then be driven toward the gingival wall with a sweeping motion from side to side, undermining the enamel on the proximate surface, the operator being careful to keep the bur close to the enamel wall in order that the axial portion of the cavity may not be made too deep. When sufficient depth of cavity toward the gingival wall is obtained, the bur is withdrawn and, with chisel and mallet, the overhanging enamel walls are broken down until the proper outline form is produced. The bucco-axial and linguo-axial margins should be made as straight as possible from occlusal to gingival in order that the buccogingival and linguogingival angles may be well out of the embrasures and in the area of immunity; for these are the most vulnerable portions, of the cavity outline, where a recurrence of decay is most liable to occur. The occlusal outline form will carry the margins into smooth territory and will not be placed in a groove or pit where the margin of the finished filling will be rough in consequence.

The resistance form is made by cutting a flat step in the occlusal surface with an inverted cone bur, the axial walls being made at right angles to the step and parallel to each other, and the cavity thus being made as nearly box-shape as possible. The portion of the cavity extending toward the gingival wall in the proximate aspect will be made with a flat gingival seat and the axial walls made at right angles to the seat with the walls parallel to each other.

The retentive form in this class is largely cared for in the making of the resistance form for the flat seats, and parallel walls are all that is necessary for the retention of a gold foil filling that is well condensed into a cavity thus made. It is permissible to make slight undercuts in the pulpo-axial angles in the occlusal step, and also to make them in the axiogingival angles in the proximate portion of the cavity, but these undercuts should never degenerate into deep pits, which weaken the walls of the cavity and make the insertion of the gold into the pits very difficult.

The convenience form is fairly well satisfied by the making of the cavity

with an occlusal step, but if all portions of the cavity cannot be reached by the plugger point, additional convenience should be obtained by cutting away the walls of the cavity until perfect access is obtained. It is far better to sacrifice a portion of the tooth in obtaining perfect access and thereby making a good filling that will save the tooth, than to attempt to save a portion of the tooth, and not be able to adapt the filling material perfectly to the walls of the cavity, and lose the whole tooth by reason of a recurrence of decay brought on by a faulty adaptation of the filling. Any remaining decay must now be removed, the enamel margins trimmed and the cavosurface angle made with sharp chisels and marginal trimmers. The gingival margin must be given especial care in the making of the cavosurface angle, for here the enamel rods incline toward the root, and if a straight cut is made horizontally across the tooth, there will be multitudes of short enamel rods left at the margin that will fall out under the slightest stress and leave a vulnerable spot for the recurrence of decay. The Black marginal trimmers or those that were suggested by me many years ago may be used. The latter are made by taking a Black 14-6-6-hoe and beveling the edge right and left, a pair of marginal trimmers thus being made that are admirably adapted to the purpose, or a pair of the instruments in the Crandall Woodbury set for the purpose of sharpening the angles of the cavity, No. 12 right and left in that set. The angles all around the cavity should be beveled with a sharp chisel and the toilet of the cavity should be made.

Class III cavities in the proximate surfaces of the incisors should have their outline form as inconspicuous as possible to be consistent with perfect filling, but the thought of hiding the gold should never be carried so far that the safety of the tooth is endangered. The teeth should be well separated before the operation is commenced. This is desirable in all cavities in the proximate surfaces of teeth. In the molar and bicuspid region, where access is obtained from the occlusal surface, sufficient separation may be obtained to bring the filling to full contour by the wedging of the gold in condensation; but, in the incisor region, separation is essential for access, unless too much of the tooth is lost in making the cavity sufficiently accessible. The separation may be obtained by previous methods, as with cotton tape, or guttapercha applied several times, or it may be obtained by the immediate method with the Perry or Ivory separators. The outline form on the labial surface should be enough to clear the approximating tooth perfectly, for it is necessary to do this in order to bring the filling into immune territory, and it is esthetically necessary for the reason that, if the gold is not brought into view, but is hidden between the teeth, it makes a dark spot, and the tooth looks as if it were decayed. A frankly visible gold filling is better than a hidden one that makes the tooth look dark at that point. The lingual aspect of the cavity should be well cut back for access and in order to make certain that there is no unsupported enamel in that region. The danger is that the dentin may be cut away at the lingual and leave a thin enamel margin which will break away during the stress of mastication; for the lower incisors normally occlude against the lingual surfaces of the upper incisors, and if

there are weak enamel margins over a gold filling at this point, the enamel will break away and leave a fault in the filling.

The resistance form is made by making a flat gingival seat or one that conforms to the gingival line; for, in the incisor region, the gingival line at the proximate surface is decidedly convex, and if a perfectly flat seat were made at this point, it might cut into the cemento-enamel junction if made deep enough to carry the rest of the filling under the free margin of the gums. The axial walls should be made as nearly at right angles to the gingival seat as the nature of the tooth will permit. As the tooth is wedge shaped, this is impossible in the concrete, for the walls will approach each other as they proceed incisally, ending in a point angle at the incisal. The retentive form is satisfied with sharp angles at the labiogingival and linguogingival angles, and the same at the incisal angle. The cavosurface angle is made by beveling the enamel all around the cavity with a sharp chisel. The toilet of the cavity is now made and the cavity is filled.

Class IV cavities occurring in the proximate surfaces of incisors, involving the angle, offer problems of retention that are intensified by reason of the loss of the incisal angle and the impossibility of anchoring at that point. The old method of cutting the angle back far enough to clear the decayed portion and then to drill a pit between the enamel plates at the incisal angle has been abandoned because of the frequency of failures due to the filling being forced out of the tooth at the incisal edge, the result of insufficient anchorage; or to the breaking of the incisal angle, from weakness of the angle, the result of drilling the pit between the enamel plates. The method here advised is that of the step cavity. This is made by cutting the proximal enamel walls back to sound tissue, leaving intact as much of the labial plate as possible in order to hide much of the gold. Unsupported enamel must not be left for several reasons: (1) because it will not be strong enough to resist the stress that will be brought to bear on it, and (2) because the thin enamel wall will allow the gold to be seen through the translucent tissue and give an unesthetic effect. The incisal portion will now be cut down with a carborundum stone. The depth of the cutting depends on the stress that will be brought to bear on the finished filling. If there is any considerable amount of incisal occlusion, the depth will have to be from 1 to 1.5 mm. on the labial surface, and considerably more on the lingual aspect of the step. This depth will be necessary in order to provide sufficient space for the building of an amount of gold on the incisal angle to stand the incisal stress without flowing. If this is not done, the gold will flow away from the walls of the cavity, and a failure will result. Some of the older operators attempted to make this cavity by making a step entirely to the lingual, in order that the gold might be hidden from view, but the frequent breaking down of the unsupported enamel at the labio-incisal angle has demonstrated the fallacy of that preparation, and now the labial wall, as well as the lingual one, is protected by building the gold over it. The lingual aspect of the cavity is made much deeper because more stress is brought to bear on it, because the lower incisors have their impact on the lingual surface of the upper

incisors, and also because the building of the gold more deeply at this portion of the filling does not do violence to the esthetics of the case, the gold being hidden from view on the lingual portion of the filling.

The cavity must be cut far enough beyond the middle third of the tooth to enable the pit to be drilled in the incisal surface without endangering the pulp, as it might do if the pit were sunk in the middle of the incisal surface, for the recessional lines of the pulp frequently contain some fine shreads of the pulp that have not sufficiently receded to enable a pit to be drilled at any depth without encountering them. Therefore, the labial step should be carried beyond the middle of the tooth. The margin of the cavity must not be laid in a developmental groove, for the enamel is very weak at such points, and if the margin were made in such a groove, the enamel rods would be in danger of falling out, leaving a fault in the filling.

The resistance form is made by making a seat that is as flat as is possible under the circumstances, but we remember that the cemento-enamel margin in the incisor region takes a decidedly convex form, and if a flat seat were made at any appreciable depth, the enamel line would be cut through and a point of weakness thereby made. The gingival seat, therefore, is made to conform to the cemento-enamel junction and will be slightly convex instead of flat labiolingually; but it should be flat from the beginning of the cavosurface angle to the axial wall. The lingual and labial axial walls should approach each other as they proceed incisally with the point angles at the gingival margin decidedly sharp. When the cavity reaches the incisal step, there should be a groove made in the dentin of the step, and, at the farther end of the groove, a pit should be sunk into the dentin to prevent lateral displacement of the filling. The retentive and convenience forms are satisfied with the resistance form as it is outlined above, and the cavity will be finished by beveling the angle all around the cavity. The toilet is made by thoroughly cleansing the cavity, which is now ready for the filling.

Class V cavities are those occurring in the gingival surfaces of all of the teeth. These cavities are the ones above all others that are due to the neglect of the toilet of the mouth, for they are in a position in which they are easily kept clean, and they would not decay if the patient were as careful of the toilet of the teeth as he should be.

The outline form is determined by the shape of the tooth. If the tooth is one of the bell-shaped variety, the incisal extension will have to be considerable; for the bell shape of the tooth will prevent the bolus, in mastication, from scouring the gingival portion of the tooth until well toward the beginning of the middle third of the crown. In flat teeth, this does not obtain; for the scouring action of the bolus is manifested well down toward the gingival portion and it will not be necessary to extend the cavity toward the occlusal aspect of the tooth nearly so far in the flat teeth, as in the bell-shaped ones. The cavities in all cases must be carried under the free margin of the gums, and this class is no exception to this rule. The distal and mesial angles must be carried to the angles of the tooth; for we rarely find the beginnings of decay at the angles of the tooth.

The resistance form is made with a flat axial wall which, in this class, is the seat of the cavity, the gingival, occlusal or labial as the case may be, and the mesial and distal walls are made parallel to each other and as nearly box-form as possible. The retentive form is made by emphasizing the angles even to the making of small retention pits in each angle. The convenience form is usually satisfied in the making of the outline and resistance forms, and all that will be necessary to complete the cavity will be to make the cavosurface angle all around the margin of the cavity with a sharp chisel.

The operator will find these cavities and all combinations of the several classes; but a familiarization of the rules governing the making of the cavities of the several classes will enable him to develop a definite technic that will make it possible to prepare any cavity with scientific accuracy, and to make a foundation for fillings that will serve the purposes of tooth preservation and masticatory efficiency.

DISCUSSION

Horace I. Beemer, Newton, N. J.: Dr. Conzett has explained to the minutest detail the proper preparation of the various classes of cavities for the malleted gold filling and then stops. Why get the cavity all ready for the filling and then stop? I shall venture a guess as to that later. Dr. Conzett was one of the earliest, most earnest and most skilful followers of the teachings of Dr. Black. It was my good fortune to meet him, many years ago, when he presented these methods at both public and private clinics in New York City, and in a small way to assist him with his work, which gave me an excellent opportunity to observe every step of his wonderful operations. In those days, he did not stop with preparing the cavities; he also filled them, and they were hand malleted at that, and what beautiful fillings. Dr. Black's methods were then new to the Eastern dentists, and we were very skeptical about that "extension for prevention," but after observation of a few of the restorations made by Dr. Conzett, there was a great change of opinion, and all who saw him operate were filled with great enthusiasm for the Black methods, and study classes were at once formed. But that is long ago. There have been many changes in the arts and industries since those days, and dentistry has had her share. Each successive generation lauds itself on enjoying an era of great progress. We believe we are having an era of undreamed of progress, and so we are. Who that was present can forget the great ovation that was given Dr. Taggart that epoch-making night in New York when he first presented to the profession his wonderful invention? Then was dentistry revolutionized, and the malleted gold filling practically went into the discard. It is in its shroud. The death knell of the malleted gold filling was sounded that night in New York when Dr. Taggart gave us the gold inlay and blazed the trail to a far easier and who shall not say, better way for both patient and dentist; and who would return to the grueling methods of the inquisition of dentistry to the malleted gold filling? Dr. Conzett has told us how to prepare cavities for the malleted gold filling, and his gold fillings were works of art, things of beauty and a joy forever, for those who do not have to sit for them. Yes, he has told us to the minutest detail how to prepare these cavities, and he is a past master in the art not only of telling how, but of performing the operation, and now I will make my guess as to the real reason why Dr. Conzett has dealt only with cavity preparation. Being an honest and conscientious operator, he tells us exactly what he does in his own practice—prepares these cavities carefully and beautifully just as he has explained, and then fills them, not with malleted fillings, but with gold inlays.

CAVITY PREPARATION FOR THE AMALGAM FILLING*

By RALPH R. BYRNES, D.D.S., F.A.C.D., Atlanta, Georgia

THE failure of amalgam fillings, an incident which we observe every day in practice, is due as much to the abuse of cavity preparation for amalgam as to the abuse of the filling material itself. Referring to that part of Dr. Conzett's paper which outlines the steps in cavity preparation as laid down by G. V. Black: It is our failure to follow these principles and the definite technic which they require that constitutes the greatest single factor in the failure of amalgam fillings.

It is just as essential that we have correct outline form, resistance form and retention form for an amalgam restoration as for a foil filling. The extension of the cavity walls into areas immune to caries, and the preparation of the cavity with a flat base and parallel walls, must be carried out just as carefully for amalgam as for foil. Again, cavity defects more readily reveal themselves during the insertion of the foil filling, while with the amalgam filling, defects are more easily concealed, temporarily. If there is to be any difference in the care exercised, it should favor the amalgam, for the material we are using is not so stable in the matter of expansion and contraction under heat as is foil. We are all familiar with that characteristic of amalgam known as spheroiding. Unless we prepare our cavities with flat bases and parallel walls, we are aiding and abetting that tendency in the material.

Having established proper outline, resistance and retention form, we must look to the convenience form of the cavity; for we are in nearly as great need of easy access to all parts of the cavity in amalgam fillings, as in foil. We have been told, over and over again, that there is no more difficult material to place properly in the mouth than amalgam. Yet, every day, we have evidence of the fact that a great majority of dentists do not give themselves half a chance to place an amalgam filling properly, for the reason that they do not take the time necessary to prepare correctly the cavity which is to receive it.

In the omission of the use of the rubber dam, we have another potent factor in the failure of amalgam fillings. How often have we seen amalgam placed in the mouth in a bath of saliva? No wonder we have weak fillings and a recurrence of caries. Cleanliness is just as necessary in amalgam technic as in any other.

Having placed the dam, we are ready to remove the remaining carious dentin. This must be thorough if the filling is to be successful. I am afraid that the too great faith which has been placed in the antiseptic value of inert metals

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in the past is another cause for amalgam failures.

The most essential point of difference in the preparation of cavities for amalgam and for foil lies in the beveling of the cavosurface angle. Dr. Black taught that, for foil, the cavosurface angle should be beveled from 6 to 10 degrees centigrade from the plane of the wall and that the bevel should include one-fourth the length of the enamel rods. The only difference in the finishing of the cavosurface angle for foil and for amalgam is that, for amalgam, the bevel is made longer because amalgam has not the edge strength of gold, and, therefore, we need a greater bulk of the material against the margin for strength. The bevel for amalgam should be much longer than for foil or for inlays. In fact, it may include all of the enamel wall, and, where the enamel is thin, may even include a portion of the dentin wall. Because of the fact that amalgam has a more friable edge than foil, it was once thought that the cavosurface angle of the cavity should be finished as nearly straight as possible and without any bevel. This is as fallacious as the old theory that as long as the base of a cavity was wider than the opening, the filling could not be lost. We should insist on the beveling of the cavosurface angle for the protection of the enamel margin; for, unless it is beveled, the margin will contain numbers of short enamel rods, which have no strength and will break away under the stress of mastication, leaving a vulnerable spot or line for the beginning of a recurrence of caries.

Having beveled the cavosurface angle of our cavity, let us not forget that the observance of the toilet of the cavity is an absolute essential for all types of fillings.

Referring again to Dr. Conzett's paper, in which is outlined Dr. Black's classification of cavities, may I say that our cavity preparation for amalgam is necessarily limited to Classes I, II and V, since no one would think of placing amalgam in the anterior teeth. As a matter of fact, the placing of amalgam anterior to the distal surface of the first bicuspids is most certainly contraindicated, and in a great many cases in which the facial muscles are very active, amalgam is contraindicated anterior to the distal of the first molars.

In connection with Class V (gingival third) restorations, there are those who aver that, next to highly glazed porcelain, there is no material more acceptable to the gingival tissue than amalgam, a fact which should not be lost sight of by those who are so vehement in their condemnation of amalgam as a filling material.

One may have the technic of cavity preparation under perfect control and yet make a failure of the amalgam restoration unless the material is properly manipulated in mixing and placing it in the cavity. Conversely, one may have perfect control of the manipulative technic of amalgam, and if the cavity preparation is faulty, the filling will be a failure in the end. We should not neglect our amalgam restorations; for the patients who cannot afford to pay for gold fillings—and their number is legion—are entitled to the best we can give. Careless attention to the details of cavity preparation and the shoddy amalgam restorations which result are inexcusable in this day of better knowledge of the principles un-

derlying correct cavity preparation and the manipulation of amalgam.

In the treatment of the subject of this paper, I have not deemed it within my province to enter into a discussion of amalgam, *per se*, in which we might have considered its most interesting history and development, enlarging on its peculiar properties, advantages of crushing resistance, insolubility, convenience of manipulation and ease of polish; nor to discuss its disadvantages of inharmonious color, spheroiding, flow, expansion, shrinkage, lack of edge strength and high conductivity. Neither have I thought that it lies within the province of this paper to dissertate on the order of procedure in proper amalgamation, correct plasticity, the consecutive stepping of the condensing plugger, proper removal of the excess of mercury, errors of technic, selection of correct pluggers, the proper use of matrices, etc. These, in themselves, offer sufficient material for a paper.

40 Forrest Ave.

DISCUSSION

A. M. Wash, Richmond, Va.: While I would not think of trying to discredit any of the other filling materials by seeming too enthusiastic regarding amalgam, I believe that, if the proper technic is followed in the preparation of the cavity, the manipulation of the material and the proper finishing of the filling, it makes a far better restoration than the average dentist is willing to give it credit for. I believe that the failure of so many amalgam fillings is due chiefly to the careless attitude of the average dentist toward this filling material. The same operator who spends much time and care in preparing a cavity for an inlay or gold foil filling often becomes very careless when preparing a cavity for amalgam. I usually think of amalgam as the much abused filling material, and I am glad of the opportunity to say something in its defense. We are too much inclined to think of amalgam as a cheap filling material, so much so that our patients often get the same idea in regard to it. The amalgam filling is not a cheap filling material except as we make it cheap by our careless attitude toward it. Too often do we prepare our cavities for this material with the feeling that any thing will do. Then, if the filling is a failure, we blame the material for it. I can see no reason why the kind of filling material to be used should have any influence on our care in preparing the cavity. If amalgam were not so easy to manipulate, I believe we would give more time and care to the preparation of cavities for it. I am even tempted often to wish that it could not be inserted without the use of the rubber dam. In other words, its ease of manipulation invites careless work. I am glad to hear Dr. Byrnes say that proper access to the cavity is almost as important for amalgam as for gold foil. Proper care in preparing a cavity in all the seven steps outlined by Dr. Black is just as important for amalgam as for any other filling material. In preparing the cavity, we are laying the foundation for the filling, and if the filling material we must use is not so good as some of the others, we may even go a step farther and say that the cavity preparation is more important. In the matter of cavity toilet, I cannot understand why anyone should argue that there should be any difference in the care in performing this important step, regardless of the kind of material to be used. The unfortunate thing is that in the case of amalgam this step can be neglected without any apparent bad results at the time of operation and without interfering with the placing of the material, but in the case of foil it cannot be neglected without seriously interfering with the subsequent steps in completing the operation. In spite of its shortcomings, amalgam has earned its place among the other filling materials. I am afraid that many of us in our overenthusiasm for the gold inlay often overlook the indications for the use of amalgam. In those Class II cavities in which the gingival wall extends far below the gum margin, an amalgam filling with a good gingival margin is much better than an inlay with a doubtful margin.

CAVITY PREPARATION FOR CAST GOLD INLAYS*

By R. H. VOLLAND, M.Di., D.D.S., M.D., F.A.C.D., Iowa City, Iowa

A SYSTEM of cavity preparation for fillings founded upon scientifically proven principles was given the dental profession by G. V. Black. That system has been put to test by many operators over a period of thirty years and has been found to be sane and effective. It was only during the last years of Dr. Black's life that the gold inlay began to come into general use as a means of restoring lost tooth substance. Since the gold inlay is called on to meet the same conditions as those relating to a gold foil restoration, it seems logical that essentially the same rules and principles should apply to cavity preparation for it, with only such slight modifications as are necessary in order to apply the inlay process.

In the preparation of cavities for inlays, the general steps of procedure—outline form, including extension for prevention; resistance form; retention form; preparation of walls and margins, etc.—as discussed in the first paper of this symposium, should be followed.

The process of inlaying, whether it be with ivory, wood, gold or what you will, presupposes that a cavity shall be so shaped as to permit the accurate seating of the inlaying piece. In the case of a cast gold inlay for a tooth cavity, it further presupposes that the cavity shall be so shaped that a wax pattern of the cavity can be withdrawn without danger of distortion. These factors demand that a cavity shall be cut to one of two types of form—a perfect box form or one slightly hopper shaped. It is reasoned that a hopper type of cavity insures a greater margin of safety in removing the wax pattern and permits a closer adaptation of the inlay to the cavity walls. This principle is exemplified by the adaptation of a tapered glass stopper in the mouth of a bottle. The degree of divergence of the walls governing the outlet of an inlay cavity has been widely discussed. From the standpoint of good mechanics, it would seem that the minimum of divergence is the most desirable. A satisfactory hopper shape is provided if these governing walls form with the seat of the cavity an angle that is just slightly greater than a right angle. It must be borne in mind that the arrangement of the enamel rods, the contour of the tooth, the presence of defects in the enamel or of abraded areas, the necessity of pulp protection, the weakness of cavity walls, etc., may require a greater inclination of a part or all of a wall in order to meet these conditions in individual cases. Such modifications can usually be accomplished without material detriment to the required resistance form. But the minimum of divergence

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is always to be preferred. This factor, together with flat floors or seats established at right angles to the ordinary thrusts that may come upon the completed restoration, produces the maximum resistance form of a cavity.

Owing to the nature of the inlay process, undercuts and retention angles are not permissible. Certain modifications in cavity form are necessary to provide some retention for an inlay.

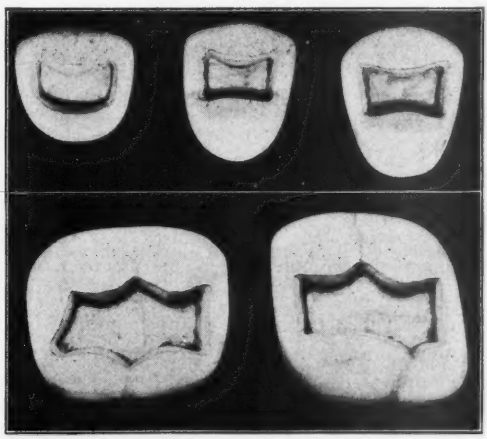


Fig. 1.—Occlusal cavities.

These modifications usually take the form of dovetails, pits or depressions for the reception of pins and posts. An inlay is prevented from being dislodged in the direction of the outlet of the cavity by the frictional resistance established by the interposed cement. The adhesion of cement is an undependable factor in retaining an inlay. The frictional resistance of the cement is most effective when the cavity has the maximum resistance form and the inlay is closely adapted to that form. Therefore, the more perfect the resistance form, and the more exactly the inlay is adapted to the cavity, the less the necessity of extensive or pronounced modifications of cavity form to provide retention.

In most cases, the required convenience form is accomplished when the cavity walls are diverged only sufficiently to permit the safe removal of a wax pattern. Under certain conditions, in order perfectly to adapt the wax and to remove the pattern, more tooth substance must be removed than is required to fulfil the strict requirements of outline, resistance and retention forms.

At this stage in the procedure, some carious dentin may still remain in the cavity, and its removal may produce undercuts or irregular walls. When the previously discussed requirements of a cavity have been met, it is permissible to fill such undercuts and to cover irregularities with cement.

The finishing of the walls and margins comprehend two things: (1) finish

of the general cavity walls and (2) the bevel of the cavosurface angle. The walls that govern the outlet of a cavity must be made smooth and flat.

Fig. 2.—Mesiodistal longitudinal section of a lower second molar containing an occlusal cavity preparation.

Walls that act as resistance planes should be made smooth and at right angles to the lines of stress that will ordinarily come upon the completed restoration. The enamel and the dentin of a wall should be cut in the same plane. The cavosurface angle is beveled to insure the removal of any unsupported enamel rods. Under certain conditions on the occlusal surfaces and incisal edges, this bevel may provide a necessary protection to the enamel wall. In planning and producing this level, the operator must be guided by three considerations: (1) the direction of the enamel rods; (2) the possible stress that may be spent upon a margin, and (3) the possibility of removing the pattern without distorting the wax that covers the bevel. As a general procedure, these features are accomplished by the use of a suitably formed sharp chisel held in a firm grasp and used with planing motion. This technic should be continued on a cavity wall or margin until the operator, through the sense of touch, knows that a continuous uniform cutting takes place as the chisel passes over the entire extent of the wall or margin. The use of chisels to scrape a wall or margin may be useful in some locations. Cylindrical and tapered

Fig. 3.—Mesiodistal longitudinal section of a lower second molar showing the treatment of deep caries in an occlusal cavity preparation.

stones and burs can be used to advantage in a few locations. Thus, all cavity walls should be cut to smooth, flat

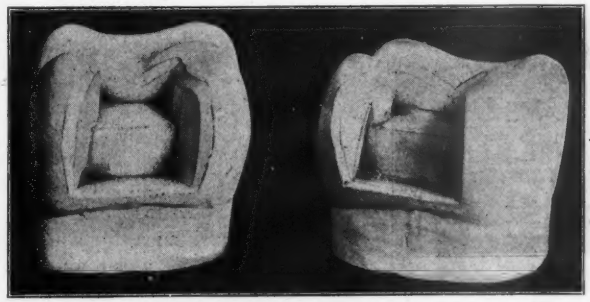


Fig. 4.—Mesioclusal cavity preparations for (left) a gold inlay restoration and (right) a gold foil restoration.

planes, and, as a sequence, all cavity angles will be clear and definite.

Class I cavities—those beginning in pits and fissures—call for a very simple preparation. (Fig. 1.) All walls must be cut so that they will incline outward a very little from the seat or pulpal wall to the orifice of the cavity—just enough that a wax pattern can be safely withdrawn. (Fig. 2.) In the majority of cases, sufficient extension is made if the cavity involves the central one third of the inclines of the sulcus. It is always advisable to follow out the fissures and grooves to a location that will permit a perfect finish of the restoration to the margin. It is not a good plan to make long narrow extensions and sharp outline angles in accomplishing this result. These faults in a cavity add to the difficulties in producing a satisfactory inlay. Tooth substance should be cut away to give the cavity outline and walls gentle curves. In extensive occlusal cavities, a cusp or wall may be so weakened that it becomes necessary to bevel it

Fig. 5.—Left to right: Proximal view of a Class II cavity preparation for an inlay in an upper bicuspid; mesiodistal longitudinal section; occlusal view.

away sufficiently that the gold of the completed inlay will cover and protect it. The pulpal wall should be cut at

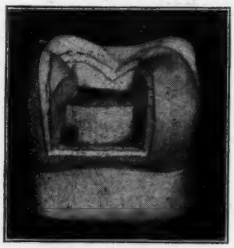


Fig. 6.—Mesioclusal cavity in upper first molar. The mesiobuccal cusp is beveled to illustrate the method of protecting a cusp or wall weakened by caries.

right angles to the long axis of the tooth. This produces a cavity of practically uniform depth, a feature that is of advantage in obtaining satisfactory castings. In very deep decay, it is often not advisable to establish the pulpal wall on a level with the deepest penetration because of possible damage to the pulp. (Fig. 3.) Cement may be used to fill the deepest portions, and a flat partial pulpal wall can be cut in the dentin around the periphery of the cavity at a moderate depth. The bevel of the cavosurface angle will be determined largely by the necessity of protecting the enamel margin from pulverization by occlusion. If a bevel is to be used, it should extend into the cavity approximately one-fourth the thickness of the enamel and a like distance on the surface of the tooth.

Class II cavities—proximoclusal cavities in bicuspid and molars—resemble those advocated for gold foil. (Fig. 4.) The resistance form of the cavity is provided by a flat gingival and a flat pulpal wall cut at right angles to the long axis of the tooth, with the cavity walls meeting the pulpal and gingival at as nearly a right angle as possible, but still providing a slightly hopper shape.

In the proximal portion of the cavity, the buccal and lingual walls should lie, in general, parallel to the enamel rods in a mesiodistal direction. (Fig. 5.) Since extension for prevention requires the margins of these walls to be located at or near the line angle of the tooth, and since the enamel and dentinal portions of these walls should lie in the same plane, these walls usually meet the axial wall at an obtuse angle. If caries has weakened a cusp or wall so

Fig. 7.—Occlusal views of a group of Class II cavity preparations. Left to right: Upper bicuspid; upper first molar (distal pit not involved); upper first molar (distal pit involved); lower first molar.

that there is danger of its breaking under ordinary strains, it is advisable to provide protection by carrying the inlay over the cusp or wall with a bevel. (Fig. 6.) The thickness of the gold thus carried over should be just sufficient to answer the purpose, and thus the bevel should not extend so deeply into the cavity as to destroy the required resistance and retention forms. An appreciable dovetail should be made in the occlusal portion to prevent the inlay from being dislodged proximally. (Fig. 7.) Usually this dovetail appears in making the extension necessary to follow out fissures and grooves. The bevel of the cavosurface angle requires special care. (Fig. 8.) The enamel at the gingival margin is so thin that the bevel will probably extend over its entire thickness. This bevel is best accomplished with gingival margin trimmers. If, in planning and shaping the buccal and lingual walls on the proximal portion, the direction of the enamel rods have been followed or their outer ends slightly cut away, no bevel on the cavosurface is necessary. If one of the above-mentioned conditions does not prevail, it is necessary to bevel these cavosurface angles. At the occlusal end of these margins, the bevel should remove approximately one-fourth the thickness of the enamel and extend outward a like distance. In order that the wax which will be adapted over

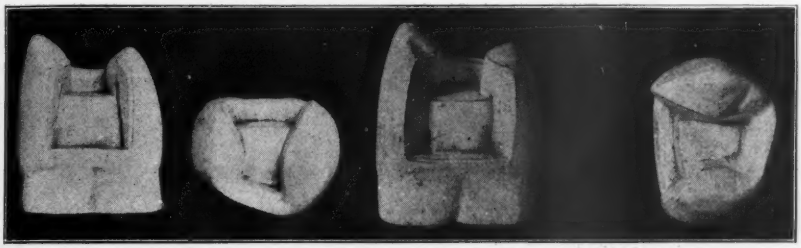


Fig. 8.—Left: Cavosurface angle beveled throughout. Right: only gingival cavosurface angle beveled.

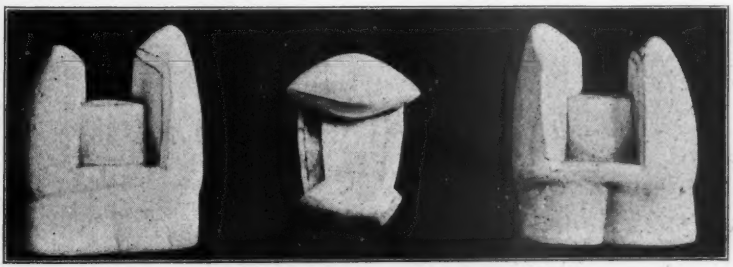


Fig. 9.—Three views of a mesioclusodistal cavity preparation in an upper first bicuspid.

this bevel in making the pattern can be safely withdrawn without distortion, the bevel should grow slightly less as the gingival is approached. The direction of the enamel rods on the occlusal surface of a tooth are so arranged that, in providing the resistance form, the outer ends of the rods are removed. The necessity of a bevel on these margins, then, will be determined largely by the advisability of providing further protection of the enamel margin against pulverization by occlusion forces.

Fig. 10.—Three mesioclusodistal cavity preparations in upper bicuspid. Left to right: Both cusps unprotected; buccal cusp beveled for protection; both cusps beveled for protection.

The preparation of cavities for mesioclusodistal restorations (Fig. 9) follows the same rules as that prescribed for proximoclusal cases, since, in the final analysis, a mesioclusodistal cavity is a mesioclusal and a distoclusal prepared in the same tooth, with the occlusal portions of both cavities blended. Mesioclusodistal cavities in bicuspids always present the problem of deciding whether or not the buccal and lingual cusps are sufficiently strong to be permitted to stand unprotected after the cavity is prepared. (Fig. 10.) This question is even more acute if the tooth is pulpless. The operator's thoughtful judgment is the only guide. This protection should be attained by a bevel that will provide sufficient gold over

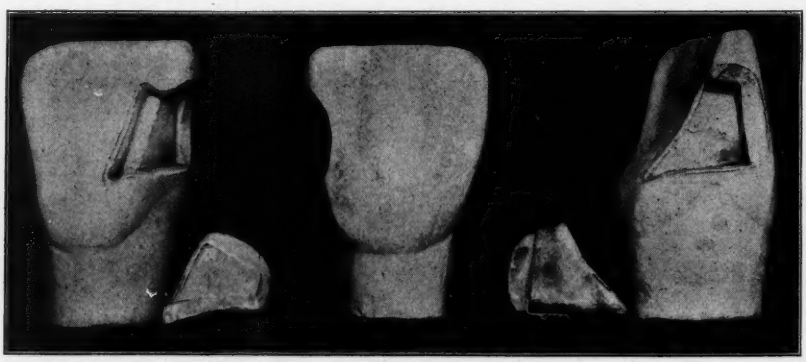


Fig. 11.—Two types of Class III cavities in upper central incisors.

the cusp, but, at the same time, not materially detract from the resistance form of the cavity. The staple form

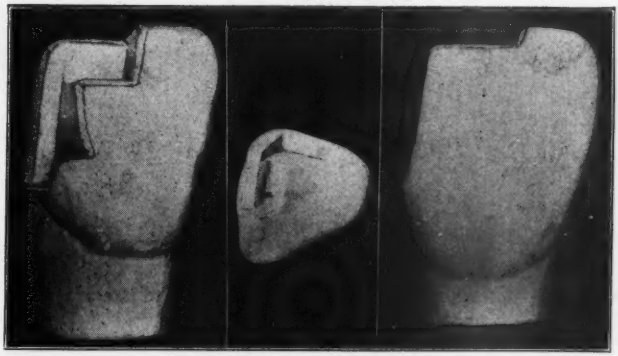


Fig. 12.—Three views of a proximoincisal cavity preparation—the step type—in an upper central incisor. Left to right: Lingual, incisal, labial.

of this type of inlay adds greatly to the retention. In preparing mesioclusodistal cavities, care must be taken that the mesial and distal portions will shed the wax pattern in parallel planes. The axial walls of this cavity must be parallel or converge slightly toward the occlusal in order to facilitate the removal of the pattern without distortion.

When gold is to be used as the restoring material, foil is probably indicated in the majority of cavities occurring in the proximal surfaces of incisors and cuspids which do not require the removal and restoration of the incisal angle. The triangular form of these surfaces, together with the arrangement of the histologic elements of the tooth, makes it possible to carry out a foil operation with less sacrifice of tooth substance and more definite resistance and retention than in an inlay, and I would urge the use of a foil filling instead of an inlay in such cavities. If an inlay is to be used, the cavity must be so shaped that the inlay may be inserted from either the labial or the lingual side. This means that one of these walls must be cut away to a level, labiolingually, with the axial wall. (Fig. 11.) The lingual insertion of the inlay is preferable unless, because of the arrangement of the teeth, such as an overcapping, it would become imperative to sacrifice a needless amount of tooth substance, thus weakening the incisal angle of the tooth

Fig. 13.—Two views of a proximoincisal cavity preparation—the step type—in an upper cuspid. Left: Labial. Right: Incisal.

and probably encroaching too closely on the pulp. In preparing this cavity so that the inlay can be inserted from the

lingual side, the incisal and gingival walls are made to diverge slightly toward the lingual and to form a right angle with the axial wall. A narrow definite stop wall is formed under the labial wall by cutting the axial wall slightly deeper. This arrangement provides the maximum resistance that is possible in this class of cavities. Retention is provided by the judicious use of grooves cut in the incisal wall at the incisoaxial angle and in the gingival wall at the gingivoaxial angle. These grooves should be the deepest at their lingual ends, gradually fading away as they approach the labial wall. This arrangement of grooves provides a dovetail anchorage when the inlay is completely seated in the cavity. If, in preparing this type of cavity, the incisal angle of the tooth is found to be weak, or it will be dangerously weakened by cutting the incisal groove, a dovetail anchorage may be extended in the lingual surface of the tooth, the lingual plate of the enamel being cut away and the dentin cut into for about one half the thickness of the enamel and to an extent that will provide sufficient dovetail anchorage. The cavosurface angle of this cavity should be beveled throughout its extent, except on the labial, since wax covering a level on this margin would be distorted when the pattern was withdrawn. In fact, it is a good plan to incline the proximal aspect of the labial wall slightly into the cavity to insure perfect wax removal.

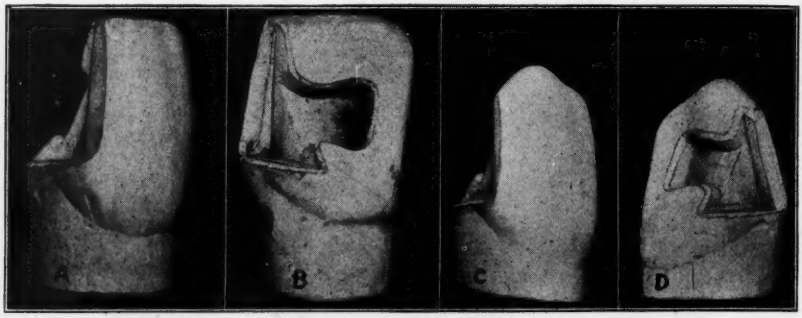


Fig. 14.—Two views of the lingual dovetail type of proximoincisal cavity preparation in (*A* and *B*) an upper central incisor, and (*C* and *D*) an upper cuspid.

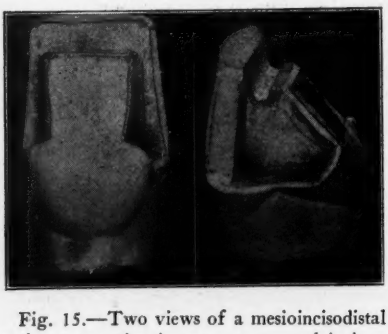


Fig. 15.—Two views of a mesioincisodistal cavity preparation in an upper central incisor.

Cavities in the proximal surfaces of incisors and cuspids which require the removal and restoration of the incisal angle can be prepared in one of

two types of cavity. The first type resembles the Black "step" for foil in outline and general form. (Figs. 12-13.) This type of cavity requires a tooth of fairly thick incisal edge as the step is cut between the labial and lingual enamel plates. The step should extend beyond the distant developmental groove. The labial wall on the step portion is cut away and leveled into the cavity, following the enamel rods, sufficiently to be well protected by gold. The lingual wall in this portion of the cavity is cut away one-fourth to one-third more than the labial. Both these walls meet a narrow flat pulpal wall, which is cut at right angles to the long axis of the tooth. The proximal portion of the cavity presents some variations from the gold foil preparation aside from the fact that undercuts must not be made. A definite right angle is developed in the shaping of the labial and axial walls.

The lingual wall is cut level with the axial wall except in the gingival third of the cavity. At this location, instead of the linguogingival angle being rounded as for foil, there is developed a short wall, the labial aspect of which forms a right angle with the axial wall and an obtuse angle with the gingival wall. This wall lies in a plane parallel to the enamel rods in this portion of the tooth. Such an arrangement of the lingual wall provides considerable resistance form and, incidentally, retention. Further retention is provided by drilling a hole, the size of an 18 to 22 gage wire, in the distant part of the pulpal wall. This hole must be located beyond the horn of the pulp and not drilled too deeply. A piece of iridioplatinum wire is fitted to this hole, and ultimately becomes a part of the inlay.

The other type of cavity preparation for this form of restoration may be

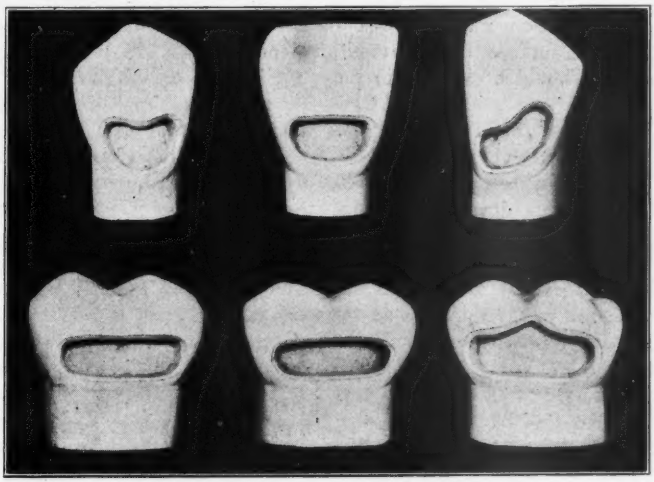


Fig. 16.—A group of Class V cavities.

designated as the lingual dovetail. (Fig. 14.) This type avoids the cutting of an incisal step and can be used in both thick and thin teeth. The proximal portion of this cavity is the same as that of a simple Class III type except that the incisal angle of the tooth is removed and the labial and axial walls are extended straight to the incisal edge. The axial and lingual walls are prepared in the same plane and meet the gingival wall at a right angle. For retention, a dovetail is cut in the lingual surface of the tooth. This dovetail should be located in the middle third of the tooth incisogingivally, extending to the distant marginal ridge. If a lingual pit or deep grooves are present, it may be advisable to include them in this dovetail and thus involve more of the lingual surface of the tooth. In depth, the dovetail portion should extend into the dentin at least one-fourth the thickness of the enamel. All angles of the dovetail and cavity should be made definite. The cavosurface angle of this cavity is beveled through its extent, except on the labial. The reason is obvious. It is well to bevel the incisal margin liberally so that the gold will protect this margin.

In cases that require a mesioincisodistal restoration, the incisal edge of the tooth is usually involved one way or another to such an extent that the logical cavity form to be made can be described as being made up of a mesioincisal step cavity and a distoincisal step cavity, with the incisal portions of both blended. (Fig. 15.)

Class V, or gingival third, cavities require a very simple form. In outline, they are similar to those prepared for foil, and, internally, they vary from a foil preparation only as far as is necessary to meet the requirements of the inlay process. (Fig. 16.)

In so brief a discussion, it is impossible to describe in detail the many cavities that may not take a strictly typical form. However, the fundamental principles set forth in this discussion can be applied to all.

BEGINNING AND INTERNATIONAL DEVELOPMENT OF PERIODICAL DENTAL LITERATURE*

By WILLIAM H. TRUEMAN, D.D.S., Philadelphia, Pennsylvania

THE *American Journal of Dental Science*, which began its career June 1, 1839, is recognized as the first periodical published in the interests of the dental profession. It is remarkable, indeed, a mystery, that the dental society publishing it, and the events leading to its publication, have been overlooked, quite forgotten for more than eighty-five years, when the publication in the *Dental Cosmos*,[1] of an interesting article entitled "A New Light on Dental History," by L. Parmly Brown, of Peekskill, N. Y., revealed the records of "The Society of Surgeon Dentists of the City and State of New York," organized Dec. 3, 1834. Several dental writers of a few years later have referred to it, but so indefinitely, that their references have not been understood.

In a foot note (page 112), Shearjashub Spooner, in his little work entitled "A Guide to Sound Teeth," indicates that this organization had marked out for itself an ambitious program; providing for social and professional intercourse among its members, the publication of a professional journal and the collection of a dental library, and looking forward to providing institutions for teaching dental students, and invoking legislative aid in protecting the community from incompetent dental practitioners. Members were to be admitted only after their competency to practice dentistry had been tested by an examining committee. There is a strong probability that this organization originated the D.D.S. degree, later adopted by the American Association of Dental Surgeons to accompany their certificates of membership, but abandoned when that society failed to obtain the right to grant degrees, not being an educational body.

Members of the Society of Surgeon Dentists were back of the effort to obtain facilities for dental education from existing medical schools, and, when this failed, assisted in organizing the Baltimore College of Dental Surgery. The invitations to the convention to organize a national dental society that met in New York, August 18, 1840, came from members of this society.

Approximately, sixty dental journals have appeared in the United States since June, 1839. Many have been short lived. Of those now published, the *Dental Cosmos*, now in its sixty-seventh year leads in longevity. Including the twelve volumes of the *Dental Newsletter*, of which it was really a continu-

*Read before the Section on History, Science and Libraries at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

1. Brown, L. P.: Dent. Cosmos, 52:936 (Aug.) 1920.

ation, it is approaching its seventy-ninth year.

The progressive members of the dental calling in Great Britain were not slow to note the movement inaugurated in the United States for professional advancement. Mr. George Waite, in a pamphlet dated 1841, voiced his regrets at the deplorable condition of affaires in England, and offered suggestions for betterment. Men prominent in dental ranks seconded his efforts. They appealed to the Royal College of Surgeons, for recognition, and were repulsed. It was at this juncture that periodical dental literature made its advent into England. The first number of the first volume of *The Quarterly Journal of Dental Surgery*, edited by Mr. James Robinson, appeared March 30, 1843, an octavo of sixty-four pages. A second number of the same size, dated June 30, the same year, ended its career. This was followed by *The Forceps*, "A Journal of Dental Surgery," and the *Collateral Arts and Sciences*, owned and edited by James Robinson. It appeared, Jan. 13, 1844, a biweekly, in small newspaper form. It came into being when the issue raised by Mr. Waite's pamphlet, appealing to Parliament, the medical profession and the public, for legislation to enforce an educational standard for dental practitioners, was under discussion. Radical differences of opinion regarding the standard, and especially how it should be reached and recognized, quickly developed.

Mr. Robinson was prominent as a practitioner, a man of means and a liberal contributor to the various projects for betterment that developed during the dental reform movement. He lacked the diplomatic reserve essential to successful leadership in a heated controversy; and it may be attributed to this fact that these two journals had an unfortunate beginning. The *Forceps* ended its career early in 1845.

This unfortunate beginning for dental journalism in England was discouraging, putting off a much needed reform for eleven long years. When the turmoil had quieted somewhat, the matter was again brought forward and earnestly pressed. July 1, 1856, a monthly dental journal was launched as the enterprise and property of Mr. Walter Blundell. It bore the title *The British Journal of Dental Science*. It found immediate acceptance, and for sixty-one years it has merited and received the support of the profession. Its editor, in introducing the journal, says: "The honor and responsibility of our undertaking demands a few introductory observations concerning our principles and intentions. Almost every class—nay, any shade of class—Science, Art, and Profession, possesses its representative journal, through which it has risen to a recognized status, while the Dental Practitioners of this country have been for many years without such an aid—a fact that is not creditable to them as a body of intelligent and really professionally educated men. The columns of the *British Journal of Dental Science* are open for free discussion, unfettered by cliqueism, and at the disposal of any and every member of the profession requiring a medium for the extension of accumulated knowledge, be it ever so fragmentary or varied in degree of excellence." Through the long years of controversy that preceded the settlement of 1878, this journal stood for unity, peace and progress,

thereby aiding in bringing about the satisfactory organization of the profession and its educational facilities that followed.

The Monthly Review of Dental Surgery, London, the immediate predecessor of the stately *British Dental Journal*, first issued, June, 1872, was edited by Oakley Coles, a distinguished dentist and dental writer. "The journal was needed," he states in his introduction "to earnestly advocate and strive to further every project which might lead to the advancement of the dental profession in this country and we shall give our best support to all useful reforms."

The journal was ably edited, and when the time was ripe, the second number of the ninth volume, February, 1880, opens with the editor's valedictory, and the announcement that the *Monthly Review of Dental Surgery* had passed from private ownership, to become the property of the British Dental Association, organized in London, March 3, 1879; incorporated, June 3, 1880.

This association was not in competition with the Odontological Society, but was organized to fill a vacant place. The Odontological Society had in its membership many who were associated with the Royal College of Surgeons, and, among the rank and file of the profession had the reputation of being exclusive. Moreover, the name, the Odontological Society of London, suggested the status of a local organization. To correct this, when the breach between it and the College of Dentists was closed by their union, the name was changed to "The Odontological Society of Great Britain." There was still a vacancy. The territory outside of London had a meager representation. It was to extend to them the benefits of organization that the British Dental Association was organized as a central body, with the provision to organize branches throughout the domain. While these branches were components of the Association, they were free to manage their own local affairs. It welcomed to its membership every dentist qualified to meet the legal requirements of the registration act.

This completed the reform called for in Mr. George Waite's historic pamphlet.

Of these two countries, in the first, where all was new, organization was quickly brought about, in the second, where the effort was hampered by organizations centuries old that contested the enterprise as infringing on vested rights, the contest was long, and acrimonious, but resulted in a triumph for organized dentistry and great public good.

These examples are cited as showing the international extension of professional development, prompted by unselfish motives, as typical of the events which have brought the same benefits to nearly every civilized nation. The professional journal, carried to all parts of the world has led to organization, education and legal protection for the profession and for the public.

DISCUSSION

H. W. Semans, Columbus, Ohio: Dr. Trueman's presentation on the beginning of periodical dental literature with its international development is quite illuminating. He has given you the spread of professional attributes as manifested by and through publication, education and association. Each of the three is a necessity to the others, for permanency. We all are pleased to think back to the 1840 period as an epoch in dental affairs, the establishment of modern dentistry

as an actual profession. It is of great interest to me, coming from Ohio, to present to you the readings on a bronze tablet placed on the outer corner of a town hall in a village nestling in the hills of southern Ohio.

BAINBRIDGE, OHIO

THE CRADLE OF DENTAL EDUCATION

Chapin A. Harris, M.D., D.D.S.
Pompey, N. Y., May 6, 1806.
Baltimore, Md., Sept. 29, 1860.

James Taylor, M.D., D.D.S.
Near Bainbridge, O., 1809.
Cincinnati, O., June 12, 1881.

Here, in 1826, under the preceptorship of his brother, Dr. John Harris, Chapin A. Harris with James Taylor received instruction in medicine and dentistry. They conceived the possibilities of dentistry in the alleviation of human suffering and their ideas gave dentistry a new birth into a scientific and professional calling. From which position it has emerged into one of the most important and beneficial divisions of health service.

CHAPIN A. HARRIS

Founded the Baltimore College of Dental Surgery, 1840; editor of the American Journal of Dental Science, established 1839. The first dental college and first dental journal in the world.

JAMES TAYLOR

Founded the Ohio College of Dental Surgery in Cincinnati, 1845; editor of the Dental Register of the West, established 1847; the second dental college and second dental journal established.

As a tribute to them for their contributions to dental science, dental education and dental literature, thereby benefiting the human race, this memorial was unveiled by the Ohio State Dental Society, November 30, 1925.

DONORS

EDWARD C. MILLS, D.D.S. and CHARLES W. MILLS, D.D.S.

CAUSE AND PREVENTION OF UNSATISFACTORY RESULTS WITH NITROUS OXID-OXYGEN ANESTHESIA*

By THOMAS C. BONNEY, D.D.S., Aberdeen, South Dakota

IN spite of many years' critical investigation, research and experimentation, the ideal anesthetic agent remains undiscovered. Until such discovery is made, occasional unsatisfactory anesthetic results are to be expected, and will even occur during the administration of nitrous oxid-oxygen, which is the nearest approach to an ideal anesthetic agent that we have for our work today. Anesthetization is not a physical experiment in which every factor can be foreseen and the results unerringly foretold, and this alone makes it inevitable that unsatisfactory results should occasionally occur in spite of every precaution exercised by those of us who administer anesthetics.

All secondary symptoms which follow the administration of . . . a general anesthetic are not dependent upon the amount of the anesthetic administered, but the toxicity and symptoms are dependent upon the rapidity of absorption, the susceptibility of the individual, the rapidity of administration and the general physical condition of the patient. What may be a toxic dose . . . of a general anesthetic for one individual may not be for another, for all factors must be considered.[1]

*Read before the South Dakota Dental Society, May, 1926.

1. Smith, A. E.: Block Anesthesia and Allied Subjects, St. Louis, C. V. Mosby Co., 1920, pp. 854-856.

There are many reasons, avoidable and otherwise, for the unsatisfactory results occasionally met with during the administration of nitrous oxid-oxygen. The purpose of this brief paper is to bring to your attention some of the most important of these reasons; to show why the anesthetic *per se* is not always to be blamed when things go wrong, and to point out some precautionary measures that will make the administration of this agent more satisfactory and render it even safer for our work than it is today. Following are what I believe to be some of the reasons for many of these unsatisfactory results. They have been referred to many times by various competent authorities and should be the common knowledge of everyone who administers anesthetics. However, they are too often neglected or wholly ignored, and are repeated here in the hope that they will serve a useful purpose.

These reasons are (1) carelessness during administration; (2) the insufficient training of many individuals administering anesthetics; (3) the longer average length of time now devoted to each operation as compared with that of a few years ago; (4) a lack of knowledge on the part of many anesthetists of the symptoms of anesthesia and of the limitations as well as the possibilities of nitrous oxid-oxygen anesthesia, and (5) lack of proper examination of many patients prior to anesthetization.

Present-day gas machines, with their great ease of operation, and constructed as they are to deliver an accurately gaged and measured flow of the gases, make for carelessness on the part of many anesthetists, who do not realize that every patient is a law unto himself, and that a knowledge of symptoms is at all times and under all circumstances of paramount importance, and who do not seem to appreciate the fact that the amount of either nitrous oxid or oxygen, or both, that a patient may require at any given time is determined solely by the symptoms exhibited by that particular patient and cannot be gaged by any rule of thumb. It is well to remember that constant care is necessary during the administration of any anesthetic, and it is also vitally important to understand that "no mechanical device can in any measure replace the sense of responsibility, the constant watchfulness and the quick response of the experienced anesthetist."[2]

The insufficient training of many individuals who administer anesthetics is a factor that is responsible for many unsatisfactory results with nitrous oxid-oxygen, for the reason that lack of knowledge prevents such individuals from being familiar with symptoms, and also makes it impossible for them to recognize the variation in type of patients.

The longer average length of time now given to each operation adds its quota of undesirable results, because, everything else being equal, the risk increases as the length of time the patient is kept anesthetized increases. The undesirability of results will always be in direct proportion to the judgment and knowledge possessed by the anesthetist, and with some types of patients, during relatively long operations, judgment and knowledge are the factors which, more than anything else, make for complete success.

A lack of knowledge of the symp-

2. Sollmann, Torald: A Manual of Pharmacology, Ed. 2, 1924, p. 685.

toms, the dosage and the limitations of nitrous oxid-oxygen contributes probably more than any other one thing to the production of unsatisfactory results. Many times patients are anesthetized with nitrous oxid-oxygen who are not fit subjects for any general anesthetic no matter how safe it may be. Given a poor anesthetic risk to begin with: add to this an anesthetic improperly administered by one who lacks training and experience, and it would indeed be surprising if unsatisfactory results were not forthcoming. "The best solution of the anesthetic problem is the learning and applying of all the available facts. Anesthetics are too empirically administered; so it is little to be wondered at that there are many difficult cases."[3] Dr. Ansel M. Caine[4] cites several cases that point out in a very decided manner the necessity for a knowledge of the symptoms of anesthesia. His paper should be of especial value to anyone who even remotely considers using secondary saturation, a procedure which I believe has absolutely no place in dental anesthesia. Dr. Caine calls attention to the very important fact that the pupil does not always dilate at the beginning of the fourth stage of anesthesia, but that in some cases dilation does not take place until paralysis of the respiratory and cardiac centers has occurred. And he proves conclusively that return to consciousness following secondary saturation (even when this procedure is practiced by an anesthetist of broad experience) does not always mean that the anesthetic results have been entirely satisfactory.

Lack of proper examination of many patients while the last is by no means the least of the reasons for unsatisfactory results. Experience soon teaches us to recognize certain types of patients as being unsuited to a general anesthetic (those with purple lips, dyspnea, swollen ankles, exophthalmic goiter), but no amount of inspection can tell us whether the patient's blood pressure is dangerously high or whether the rate and quality of the pulse are normal or otherwise, nor can it give us a clue as to the condition of the heart valves. In many instances, such information is very valuable.

> Many times a mere examination of the patient does not reveal pathologic complications, and with these patients, if . . . a general anesthetic is given, trouble is liable to ensue. The writer does not wish to leave the impression that it is always necessary to give a patient a thorough physical examination . . . for the administration of nitrous oxid-oxygen. However, in many individuals it is highly advisable to make a physical examination of the heart and lungs and take the blood pressure.[4]

Patients with an excessively high blood pressure; those with a blood pressure in which the pulse pressure is either very high or very low; those with decompensated hearts, regardless of whether the decompensation has to some extent been corrected by the use of drugs—all such patients are potentially dangerous risks for a general anesthetic of any kind. Fortunately for us, not many patients of the foregoing types have to undergo anesthesia in our work, but when they do, it is far better to know their condition before attempting to anesthetize them than to find it out after irreparable damage has been done. In patients with excessively high blood

3. Schuchard, Leo: The Problem of Handling Difficult Nitrous Oxid-Oxygen Anesthesia for Oral Surgery and Dentistry, Am. J. Surg., 38:98 (Oct.) 1924.

4. Caine, A. M.: Some Unusual Complications of Nitrous Oxid-Oxygen Anesthesia, Am. J. Surg., 37:34 (April) 1923.

pressure, cerebral hemorrhage is to be feared; in those with a very high or a very low pulse pressure, the possibility of serious shock must always be considered. Patients with decompensated hearts should never be given a general anesthetic. Those in whom compensation has been reestablished will often tolerate a general anesthetic very well, but there is always the possibility of the compensation being broken because of circumstances directly tracable to the anesthetic, and, for that reason, with these patients a general anesthetic should be avoided, if possible.

The success attained by most users of a gas-oxygen apparatus, and the uniformity with which most patients respond to nitrous oxid-oxygen has made for a more or less haphazard selection of patients to whom this anesthetic is administered. This has, in certain instances, been productive of unfortunate results, and until more care is universally used in determining a patient's fitness for anesthesia, such instances are going to continue to occur with a frequency out of all proportion to the safety of the anesthetic under consideration.

Some writers decry the use of the stethoscope and the sphygmomanometer on the grounds that it takes too much time, that it needlessly alarms the patient and that it is of no particular value. Such reasoning is wholly wrong. An intelligent use of these instruments will often give us valuable information that is obtainable in no other way. This information is quickly and easily secured and is frequently the means of preventing extremely unsatisfactory results. The use of these instruments is not always necessary but it is only by their routine use that we will be able to derive the greatest possible amount of good from them. They occasionally reveal unexpected conditions a knowledge of which is of great value. Aside from the blood pressure and the rate and quality of the pulse, there are several indices that are valuable in assisting us to determine a patient's fitness for anesthesia.

Determination of the cardiovascular energy index is most practical for us and is also easy. It is found by multiplying the sum of the systolic and diastolic pressures by the pulse rate. Its lowest limit of relative safety is 14; its highest, 20. For example, a patient with a systolic pressure of 130, a diastolic pressure of 80 and a pulse rate of 80 would have a cardiovascular energy index of 16. ($130+80\times80$ equals 16,800. The first two numbers only are read.) From the standpoint of his cardiovascular system, other factors, of course, being duly considered, such a patient would be a safe risk for anesthesia. The cardiovascular energy index, like other diagnostic aids, is not absolute, and, in some patients (those with decompensated hearts in which the decompensation has been masked by digitalis), it is of no value. It does serve as a very useful method for determining approximately the condition of the cardiovascular system of many patients, and, when excessively high or low, is a warning signal that should not be disregarded. The following case from practice will serve to illustrate the value of the cardiovascular energy index, as well as the value of blood pressure readings in many patients who must undergo anesthesia.

Mr. J. H., aged 65, walked into my office and asked to be given nitrous oxid-oxygen for the removal of some teeth. He did not look like a good anesthetic risk and on ex-

amination, was found to have a systolic pressure of 260, a diastolic pressure of 140, and a pulse rate of 80. His cardiovascular energy index (34) thus showed him to be a very dangerous risk. His extremely high blood pressure in itself was sufficient to warn against the use of a general anesthetic, and the cardiovascular energy index was noted simply as a check against the blood pressure.

Had this patient been given a general anesthetic, one of two things could easily have happened. Either cerebral hemorrhage with its resulting paralysis, or death from the same cause. It would have been possible, during the excitement stage, for the blood pressure to have risen sufficiently to cause rupture of a blood vessel, and while it is true that this might not have happened, the risk was too great for a general anesthetic to be considered. This patient's pulse pressure of 120 (almost 90 per cent of the diastolic pressure) also showed that his heart had little, if any, reserve power.

The pulse pressure represents the efficient work of the heart and, under normal conditions, is about 50 per cent of the diastolic pressure. It indicates the relationship existing between the kinetic energy expended by the contraction of the heart in moving the blood column and the potential energy stored in the arterial walls and the column of blood contained therein. If, therefore, the pulse pressure is extremely high, it means that there is little or no potential energy in reserve in the heart muscle, and patients with such pulse pressures are not good anesthetic risks. Regardless of the blood pressure readings and the rate and quality of the pulse, a pulse pressure of less than 25 per cent or more than 75 per cent of the diastolic pressure is sufficient evidence that the patient is potentially a poor anesthetic risk.[5]

In presenting this paper, it has not been my intention to magnify unduly the unpleasant situations that must of necessity occasionally arise during the progress of anesthesia. I feel, however, that anything that can make nitrous oxid-oxygen anesthesia safer and more satisfactory is worthy of careful consideration.

CONCLUSIONS

1. Nitrous oxid-oxygen is the nearest approach to an ideal anesthetic for exodontia and minor dental surgery that we have today.

2. In spite of its high degree of relative safety, unsatisfactory results are occasionally met with and these results are many times avoidable.

3. Unsatisfactory results could, in many instances be avoided if the anesthetist would approach his task with a keener appreciation of his responsibilities.

4. Skill, care and judgment are absolutely necessary for success in the administration of nitrous oxid-oxygen.

5. A careful examination of all patients who are to be anesthetized will do much to lessen the frequency of unsatisfactory results.

6. The stethoscope and sphygomomanometer are instruments of great value and their use will often help us to determine more fully a patient's fitness for anesthesia.

502 Citizen's Bank Bldg.

5. Moots, C. W.: Blood Pressure During Operations, Interstate M. J., 64:645 (Oct.) 1916.

THE NUMBER OF ENAMEL PRISMS IN HUMAN TEETH*

By SAMUEL W. CHASE, Cleveland, Ohio

IN gathering data for a recent paper on "The Absence of Supplementary Prisms in the Human Enamel,"[1] an attempt was made to estimate, as closely as possible, the number of ameloblasts formed in a given tooth germ, in order to compare this number with the number of enamel prisms in a tooth formed by a similar germ. No method could be devised for counting the number of ameloblasts, but the number of enamel prisms could be estimated with reasonable accuracy. The huge number of prisms was a matter of some surprise to me; hence, the numbers estimated for all teeth of the permanent human dentition are given here with the hope that they may prove of interest to many members of the dental profession.

The method employed was to measure the distal diameters of a great number of prisms from all parts of the crowns of all types of human teeth, in order to obtain an expression of the distal diameter of the average human enamel prism (0.00606 mm.). From this figure, which took the interprismatic substance into account, was computed the area of the exposed surface of the average prism (0.00002742 sq. mm.). Then the total area of the surface of each crown was measured by transferring actual prints of the outlines of the surface to millimeter cross-section paper and counting the squares enclosed by the outlines.

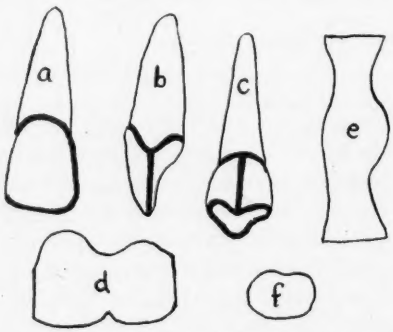
The prints were made by first drawing lines on the teeth, with hard, sharp, colored wax crayons, in such positions that the lines formed outlines which enclosed the entire surface of each crown. This involved drawing three lines on each tooth as shown in the accompanying figure; one along the cervical margin of the crown and completely surrounding the tooth; one along the line of juncture of all axial surfaces with the incisal or occlusal surface, and one joining the first two lines. The teeth were then rolled on their axial surfaces on fine bibulous paper which had been moistened with xylol and placed on a yielding, yet firm, substratum, such as a block of gum rubber or the palm of a hand held in rigid extension. The wax of the crayon lines, dissolved by the xylol, left a clear-cut impression of

*From the Laboratory of Histology and Embryology, Western Reserve University.

*Work done under grant from the Scientific Foundation and Research Commission of the American Dental Association.

1. Chase, S. W.: Anat. Rec., 28:79-89.

the lines on the bibulous paper and produced, when the rolling process was performed in such a way as to avoid slipping or twisting of the tooth, an accurate pattern of the sum total of the



Labial (*a*) and mesial (*b*) aspects of upper central incisor, and (*c*) lingual aspect of bicuspid, showing, by the heavy lines, the position of the crayon lines, (*d*) pattern of coronal surface of the incisor, (*e*) pattern of axial surfaces of bicuspid, (*f*) pattern of occlusal surface of bicuspid.

axial surfaces (outlines *d* and *e*). For incisors and cuspids, the rolling process produced the pattern of the entire coronal surface. For bicuspids and molars, a second imprint, that of the occlusal surface, had to be made (*f*). The prints so obtained were transferred from the bibulous paper to millimeter cross-section paper with the aid of carbon copying paper. Counting the squares enclosed by the patterns gave the area of the coronal surface in square millimeters. To reduce the chance of error, at least three patterns were made of each crown which was used, and the average of the trials was the figure used in the computations.

The results, based on the measurement of crowns selected to comply as nearly as possible with the average sizes given by Broomell and Fischelis in their "Anatomy and Histology of the Mouth and Teeth," are given in the accompanying table.

THE NUMBER OE ENAMEL PRISMS IN HUMAN TEETH OF THE PERMANENT DENTITION

	Upper	Lower
Central incisors	8,586,000	5,186,000
Lateral incisors	5,250,000	5,046,000
Cuspids	8,545,000	8,295,000
First bicuspids	6,960,000	6,068,000
Second bicuspids	8,223,000	7,004,000
First molars	12,297,000	11,400,000
Second molars	9,554,000	9,703,000
Third molars	8,986,000	9,012,000

CLINICAL RESULTS IN ROOT CANAL TREATMENT*

By EDGAR D. COOLIDGE, B.S., D.D.S., Chicago, Illinois

THE clinical aspect of root canal treatment is more encouraging and hopeful than the reports from some of our laboratory investigations would indicate. It has been demonstrated to us that many lesions of the various tissues and organs of the human body can be produced in animals by introducing into them cultures made from infected human pulps and infected periapical tissues. This information has thoroughly aroused the dental and medical professions, and much credit is due to laboratory investigation for the extremely valuable help it has given in developing the treatment of root canals to the point that it has now reached. Without the startling revelation made in the laboratory, this branch of dentistry would not have evolved as it has, from a neglected field to one of the most interesting and exacting duties of dental practice.

The presence of bacteria in the mouth, in the subgingival spaces, about the teeth, in carious teeth and even in the vital pulps of many sound teeth has been established as an accepted fact.[1] It is also established that there is quite a wide variation in the susceptibility of individuals to most pathogenic organisms and that a certain percentage of the individuals subjected to a given pathogenic organism would have sufficient natural resistance to become immunized against the invader.[2] Hence, the conclusion based only upon the laboratory findings would probably be as extreme as that based only on clinical evidence. We are dealing with human, living tissue in root canal treatment, and not with a test tube of culture medium, although we should be familiar with the characteristics and activity of the organisms with which we are dealing when they are given a more favorable environment in the test tube. Years of experience and observation have proved that a large percentage of pulpless teeth, carefully treated and filled, will show no radiographic evidence of pathologic tissue in the periapical region after proper root canal operations.

The task assigned to the clinical operator, or in other words the dental surgeon, is to save teeth, just as the duty of the general surgeon is to save life. In our effort to save teeth, we must not jeopardize human life; neither

*Read before the Midwinter Clinic of the Chicago Dental Society, Jan. 28, 1926.

1. Hartzell, T. B., and Henrici, A. T.: J. Dent. Res., 2: 537 (Dec.) 1920.

2. Zinsser, Hans: Infection and Resistance, pp. 14 and 49.

should we side-step the issue and extract all teeth that have infected pulps or infected root canals. The research operator should keep the clinical operator informed in regard to the characteristics and activity of the organisms and guide him in his attempt to best serve humanity. The mere presence of virulent organisms is not necessarily an indication for removal of that part of the human anatomy which harbors them.

DIAGNOSIS

The responsibility of saving teeth lies principally with the operator. To determine what teeth should be saved and what teeth should be extracted is a problem that demands the greatest attention and the use of every aid at our command properly to differentiate between the pulpless teeth that are operable and those that are not operable. Much depends on the interpretation of evidence revealed by radiograms of the teeth. Evidence revealed by information drawn from the patient in the way of history of the general health and of the local history of the tooth is extremely important. Where the history reveals a series of systemic disturbances the cause of which is believed to be focal infection, more radical treatment, such as extraction of teeth showing gross pathologic change of the periapical tissue, should be considered. When the history reveals a repetition of acute or chronic suppurating alveolar abscesses, there is much less chance for successful root canal filling than in cases in which the history does not bring out such information. I might cite such a case here.

A man, aged 35, in robust health, came in twelve years ago for restoration of a badly broken down mouth. Several teeth were pulpless, some having fair canal fillings and some poor ones, with very little periapical disease apparent. Some of these roots were carefully cleaned and filled and some were not disturbed. Bridgework was attached to all of them. During the years following, most of these roots have been lost, one by one, by acute alveolar abscesses; first, those that were not retreated and root filled and then several of those that had been gone over carefully.

A history of this kind would be a fair warning to the operator that the patient was extremely susceptible to acute alveolar abscess but not to the periapical bone absorption usually revealed by radiogram.

The evidence furnished by the radiogram shows the condition of the alveolar process surrounding the root, both in the gingival region and in the apical region. Where there has been extensive gingival resorption of the alveolar process, a successful root canal filling is seldom justified by the service received from the tooth afterward, since the tooth is so frequently lost prematurely because its alveolar support is reduced beyond its need to withstand the stress of masticating forces. Some root canals are inoperable because of curved roots or excementosis. Where there is evidence of pathologic change in the periapical tissue, with little or no chance of operating directly to the seat of the infection, canal treatment has proved very unsatisfactory.

The operator should first consider the general health of the patient; then, the age and temperament; next, the value of the tooth to the patient or to the

operator in restoring useful occlusion; next, the local condition of the alveolar process as regards the support and health of the surrounding tissue, and finally the operability of the root canal.

TREATMENT OF ROOT CANALS

Every root canal should be considered as infected, whether or not it contains a vital pulp exposed or unexposed by caries. If the pulp is infected, it is quite probable that the dentinal tubules of the root are also infected. Hence, there is danger of infecting the periapical tissue in all cases of canal treatment. If we are to profit most by laboratory information, we must solve the problem of the cause of periapical disease and eliminate this cause from our future treatment in order that our results may prove that root canal operations are justified. If many pulpless teeth showing periapical disease can be carefully treated with antiseptic drugs and the roots filled and a few years later show no periapical disease the reasonable conclusion may be made that successful treatment can be accomplished. If a series of vital and partly vital pulps are removed from teeth showing no periapical disease at the time of treatment, but, a few months or a year after the roots are filled, the radiograms show definite periapical disease and bone absorption, the reasonable conclusion may be made that something is wrong with the treatment of this class of teeth. To restate this in simple terms, let us assume that one central incisor is pulpless, showing evidence of a granuloma at the apex of the root, while the other has an exposed vital pulp. The pulpless tooth is treated with antiseptic drugs and the canal is filled. The other vital but infected pulp is removed and the canal filled. Two years after, we will suppose that the radiogram shows a normal periapical picture, with the granuloma entirely cleared up, while the tooth from which the vital infected pulp was removed has developed a rarefied area in the periapical region. What conclusion can be made? First, should we not accept the disappearance of the rarefied area on the first as evidence of the success of the treatment and filling of that canal? Secondly, should we not conclude that something was wrong with the method of pulp removal and treatment of the other case, in which the rarefied area appeared after filling the canal?

It was demonstrated from our records by J. R. Blayney,[3] and by me,[4] in 1922, that pulp removal by cocain pressure anesthesia without sufficient surface disinfection was causing periapical disease from forcing infection into the periapical tissue. Perhaps, the strong cocain solution was also a destructive agent. I am confident that the periapical disease in many pulpless teeth showing granuloma today could be traced to this source if the history could be brought to light. All cases of pulp treatment or root canal treatment should be considered as infected cases

3. Blayney, J. R.: Clinical Results of Pulp Treatment, J.A.D.A., 9: 198 (March) 1922.

4. Coolidge, E. D.: Some Interesting Tendencies in Root Canal Filling, Dent. Summary, 42: 475 (June) 1922.

and such aseptic precaution used and antiseptic treatment given as will preclude the possibility of infecting the periapical tissue.

The use of antiseptic drugs in root canal treatment is important and should precede mechanical filing and curettement of the canal. Hermann Prinz[5] states that "complete sterilization of infected tissue can only be attained by the harmonious cooperation of three important factors: absolute contact, time during which this contact is maintained, and sufficient concentration of the employed antiseptic. A break in the circuit always indicates failure."

INFECTION AND REINFECTION

It is impossible to discuss antiseptics in the time allowed, but in general, there need not be much difference in the drugs used in medicating any root canal. Nondestructive drugs that are powerful antiseptics should be used, such as cresol, cresatin, dichloramin-T, beechwood cresote and iodin. These are reliable and efficient. Complete sterilization of the dentin is impossible by drugs, and such a state as permanent sterilization of a root canal cannot be brought about. The size of the dentinal tubules is great enough to permit the entrance and passage of certain bacteria found in gangrenous pulps. According to Roemer,[5] there are 14,700 to 37,600 per square milimeter in the dentin of the root, and the greater number are to be found near the apex of the root. The diameter of these vary from 1.5 to 4.5 microns, while the length of some forms of streptococci is only 1 micron. When the pulp of a tooth becomes infected, it is quite likely that the dentinal tubules of the root become invaded by micro-organisms, and, therefore, every case of canal treatment must be considered as an infected case. If the time elapsing between treatments of the canal is longer than the antiseptic can suppress the activity of the organisms, there is no progress in the treatment. It may be considered a fairly safe test if the dressing which has remained in the canal between appointments should be almost dry and have no odor except that of the drug. Not only must the infected dentin be considered, but also the accessory canals that branch off from the main canal, which cannot be cleaned mechanically. This picture of the sources of reinfection need not discourage the operator, for experience has proved that infected canals can be successfully cleaned and filled without disturbance of the periapical tissue following. My experience has been more gratifying in treating the grossly infected canals than in removing exposed pulps that require anesthesia to prevent pain.

The most common source of reinfection is that from empty or poorly filled canals. The purpose of the filling is to close the canal to moisture mechanically, and the more nearly the canal is obliterated by the filling material, the more successful will be the operation. It is for this purpose that the long tedious hours are spent in filing and curetting the coronal opening and sides of the canal, that the apical portion may be accessible to the opera-

5. Prinz, Hermann: Diseases of the Soft Structure of the Teeth and Their Treatment, p. 222.

tion of filling. The closing of the apical foramen, the obstructing of accessory canals and the sealing over of dentinal tubules is the function of the filling material. The operator is taxed to his utmost patience and ability, and, at times, cannot accomplish his purpose, but must approach it as nearly as possible in every attempt at canal filling. Is not the same true in any professional activity? Can 100 per cent success be attained in any human effort? Surely not in the practice of medicine or surgery or mechanical dentistry.

FILLING THE CANAL

The canal should be filled at the earliest possible moment that there is assurance of surface sterility after all pulp is removed and a sufficient amount of enlarging has been done to gain access for packing the filling material to the foramen. The obliteration of the canal with some material that can be packed bit by bit into a solid mass that will fill all the open space and retain its form and density is desirable. It must be opaque to the roentgen ray and must be of such a nature that it can be removed if necessary, especially when not completely filling the canal. It should not discolor the tooth, nor should it be subject to any disintegration or decomposition. The canal being sterile when the filling is inserted, there should be no object of combining an antiseptic with the filling, for a reinfection would occur eventually if open spaces permit moisture to pass in and out regardless of an antiseptic ingredient.

Before filling the canal with solid guttapercha, which more nearly answers the requirements than other filling materials suggested for root canals at the present time, it is an advantage thoroughly to dry the surface of the canal and coat it with a rosin chloroform varnish (Callahan) after which the canal may be lubricated with thin chloropercha of eucapercha, followed by small pieces of guttapercha cones, packed bit by bit until the canal is filled with a dense mass of solid guttapercha. When the filling reaches just to the foramen but does not pass through to disturb the attachment of peridental fibers to the cementum, there is less irritation after the operation and less danger of pathologic disturbances that may result in absorption of the periapical tissue. The retention of a healthy periapical tissue is the test of a successful root canal filling.

RESULTS CALCULATED BY REEXAMINATION YEAR BY YEAR

Many interesting observations can be made by studying the case history of each tooth treated, and reexamining each case, year after year. Until a large number of operators have accumulated many pulp treatment records and have radiograms to prove the statements made, it will be difficult to present the kind of clinical evidence necessary to overbalance the evidence that has been presented from the exceptional hospital records of patients, to which reference has been made frequently by those who would extract all pulpless teeth, even for robust and healthy individuals.

Where radiographic evidence of healthy periapical tissue about root filled teeth can be presented year after year, there can be little ground for suspicion

of infection existing on the apex of the root.

It is with a considerable reluctance that I indulge in the following reference to private records. I do it hoping that it will not be misunderstood and trusting that some encouragement may be found by others interested in this field of dentistry. Addison says in his "Sir Roger De Coverley:"

> A man's first care should be to avoid the reproaches of his own conscience; his next, to escape the censures of the world; if the last interferes with the former, it ought to be entirely neglected; but otherwise there cannot be a greater satisfaction to an honest mind than to see those approbations which it gives itself seconded by the applauses of the public: a man is more sure of his conduct when the verdict which he passes upon his own behavior is thus warranted and confirmed by the opinion of all that know him.

All case histories of pulp treatment and root canal filling records are divided into four classes for clinical study: (1) pulp treatment and removal by pressure anesthesia; (2) pulp treatment and removal by local anesthesia; (3) treatment of dead pulps and pulpless teeth without periapical disease; (4) treatment of pulpless teeth with periapical disease.

Over a period of ten years, the highest percentage of success has been obtained in the treatment of pulpless teeth without periapical disease. A series of fifty cases have been followed and reexamined year by year for from two to ten years, and most of them date back five years or more. Of these, not a single case shows definite pathologic process of the bone, and only nine show any tissue change whatever. We will term these as undetermined cases. Some of these undetermined cases will doubtless show a picture of normal periapical tissue in the course of time unless traumatic injury continues the disturbance.

Results obtained in pulp removal by local anesthesia show an encouraging picture. There are only twenty-two cases in this class and all date from only one to five years back. There are no cases of bone absorption, but there are a good many that show evidence of slight disturbance in the periapical region. There are seven cases that must be kept under observation, but I am confident that every case will show radiographic evidence of normal tissue after a longer time has elapsed. Dr. Hatton[6] has shown the histopathologic picture after pulp removal and has shown how the osteoclasts and cementoclasts become active after pulp removal and filling of the root, and absorption takes place as a physiologic sequence. After this the osteoblasts and cementoblasts rebuild bone and cementum. This requires time and does not represent a pathologic change due to infection.

Of seventy-five cases of pulp removal by pressure anesthesia, most of which date from four to twelve years, I find five which show radiographic evidence of bone absorption and sixteen that are still in the undetermined class, that is, they show evidence of some periapical disturbance.

The report of cases treated showing definite periapical disease before treatment prove that many of these can be successfully treated. Many of these cases were treated in order to determine

6. Hatton, E. H.: Histopathology of the Periapical Region, J.A.D.A., 12: 49 (Jan.) 1925; Regeneration of the Apical Region After Treatment and Filling of the Pulp Canal, ibid., 13: 485 (April) 1926.

what results could be obtained, and the teeth should have been extracted at the beginning. Some were treated because the patient refused to have them extracted, although large areas of bone absorption were evident by radiograms. Of 160 cases, there are eight that have shown no improvement, and several of these had excementosis so that the foramen could not be found; which made it impossible to drain and medicate the lesion beyond the apex. There are fifty-eight cases that show marked improvement, and neither the patient nor I am willing to part with them. It will be necessary to observe them over a longer period. There are ninety-four cases that have cleared up entirely and show a radiographic picture of normal tissue.

SUMMARY

I wish to call attention to the first three groups of cases, including 147 cases treated, with only five showing bone absorption and these cases of pulp removal by pressure anesthesia. Other causes may have contributed to some of these failures aside from the treatment alone. There are twenty-eight cases still undetermined, most of which will pass into the satisfactory class in a short time. This represents about 3 per cent of failures, most of which I can account for and 19 per cent that show some disturbance but no gross pathologic change, and most of which I am confident will clear up.

If this report indicates the possibility of saving all but three out of 100 pulpless teeth, is it not proper that we should continue root canal treatment? After another two years, I feel confident a review of these same cases will result in a better showing because it will allow more opportunity for the periapical tissue to return to normal about the apices of some of the more recently treated roots. It seems quite probable that at least 90 per cent of satisfactory results can be obtained when a proper diagnosis is made and such teeth are extracted as are hopeless and inoperable.

THE PULPLESS TOOTH FROM THE HISTOLOGIC STANDPOINT*

By WILLIAM G. SKILLEN, D.D.S., Chicago, Illinois

BEFORE the status of anything important can or should be established, every available means for settling the question should be resorted to. No one means is sufficient unless, possibly, that means is an infallible one. Any comfortably functioning tooth or any tooth that might possibly be made to function comfortably is an extremely important thing. Yet its fate was determined virtually on one basis alone. Most of the criticism of the tooth, whether pulpless or not, has been based, practically alone, on bacteriologic findings, on tests that are far from being infallible.

It was a realization of the one-sidedness of this evidence that led to a study being made of the question from the anatomic standpoint. A report of the results of this study has been made.[1] Similar reports have been made by Hatton,[2] and Rickert[3] has contributed something analogous but there are no other reports except some that are only remotely related.

If the pulpless tooth is infected, and especially if dangerously so, the tissue in the canal or adjacent to it should show some indication of it. On the finding of such indications, it was hoped to obtain some fresh inkling as to the status of these teeth.

The specimens from which the study was made were collected from various sources so that they might be more nearly similar to those that come up every day for consideration. Unfortunately, because of this, practically no data could be obtained concerning them, so that their scope of usefulness has been somewhat curtailed. The study has, however, been worth while in bringing to light a few things of general and specific value.

In general, first, the study has indicated that possibly by this means some of the causes for success or failure in the treatment and filling of root canals may be determined. It should enable the clinician to analyze more fully the accurateness and dependability of his technic. Obviously necessary, of course, to the value of such a study, is a definite and fixed technic and a detailed, accurate history. A number of questions occur that might be answered by a study of this kind: how well the canal has been curetted, or, in other words,

*Read before the Midwinter Clinic of the Chicago Dental Society, Jan. 28, 1926.

1. Skillen, W. G.: Status of the Treated Tooth, J.A.D.A., 13: 291 (March) 1926.

2. Hatton, E. H.: Possibility of Apical Regeneration After Root Canal Filling from the Histopathological Point of View, J.N.D.A., 9: 192 (March) 1926; J.A.M.A., 77: 1805 (Dec. 3) 1921.

3. Rickert, U. G.: Dent. Cosmos, 67: 635 (July) 1925.

how well the pulp has been removed up to a given point; the character of the pulp remnant or the changes which it has undergone, or how it has reacted under given circumstances, and whether or not the removal of any particular tooth was justifiable. Many others will no doubt occur. By correlating such findings with the history and the details of technic, a considerable insight into the problem of the treatment of the tooth with an involved pulp should be obtained.

The second general indication is that by far too many radiograms inadequately fulfil their purpose. In the absence of clinical signs, the radiogram becomes extremely important; in fact, is the only means at our disposal for making a diagnosis. If it is indefinite or inaccurate, its value decreases. A number, even, taken at different angles, may be absolutely necessary to disclose possible hidden and slight indications of trouble. Especially may this become important when every possible source of infection, no matter how small or apparently insignificant, must be determined. The preservation of a harmless, comfortably functioning tooth should be considered important enough to call for even greater care than this. In many instances, the radiograms that accompanied the specimens collected were worse than useless for the foregoing reasons. Four teeth thought to be negative were found to be in an inflammatory condition, which might possibly have been due to infection. If there existed any apical bone change which by comparison with others should have existed, the radiograms gave no indication of it simply because the area was small and unusually located. The main foramen in each of these teeth did not open in the usual place at the immediate apex, but rather high upon the side of the root. We must realize and always take into consideration the fact that the anatomy of the root canal is subject to wide variation.

More specifically, the most important thing disclosed by this study is that all pulpless teeth are not infected or an immediate source of danger. Out of about 260 teeth examined up to date, which, on the basis of the radiogram, regardless of whether the latter was good or bad, were considered free from pathologic shadows, only six, which include the four previously mentioned, could be considered a possible danger. Of the remaining 254, only four were devoid of some evidence of pathologic change taking place, or having taken place, in the pulp remnant. In other words, only four were found in which the pulp remnant had remained normal.

The change that the pulp tissue had undergone, a fibroid degeneration, may or may not have been the result of a previous infection. The change may, instead, have been the result of a low grade chronic inflammation induced by irritation, or may have been caused by trophic changes. As a matter of fact, the specimens indicate that probably in some instances there is one cause of the change, in others a different or a combination of causes was primary in bringing it about. At any rate, there were no indications of a still active infection discernible although there is little doubt that such did exist in many of these pulps at some previous time. It would seem, therefore, that infection within the pulp may be overcome, this depending, of course, on the character and extent of the infection. Quite a number of these teeth had given service for

ten, fifteen or twenty years more. Just because of this, however, they should not be viewed with equanimity or considered forever safe. For, among the failures studied, many were found in which it appeared that infection had brought about their failure subsequent to such changes. They all need continual watching.

It has been remarked that, in the absence of the clinical manifestations, the radiogram is not always a reliable source of information as to the exact status of the tooth. This appears to be true. If it is only a question of the location of the indications of possible infection, one way to minimize this defect has been pointed out. But if it is a question as to whether or not infection may localize itself somewhere in the tissues and not give any sign of its presence, that is a different thing. So far, only one instance pointing to this possibility has been found. In this case, a localized area of chronic inflammation was found to exist about the end of the root-filling. The latter extended to about the middle of the root. The pulp remnant below the area of inflammation, toward the apex, was of a character similar to those previously described and showed no signs of active inflammation. The radiogram, although fairly good, did not show any reaction on the part of the apical bone tissue to this hidden inflammation, yet such an inflammation might well indicate infection. Such an instance cannot be considered very serious, especially when it is only one of so many. Still, it leaves room for doubt and cannot be overlooked. Further search for and study of such is necessary to determine just how frequently they occur and at just what stage, or in what character of inflammation, there will be a reaction set up which will be clinically noticeable.

At the present time, it can be said with some assurance that, when the inflammation, chronic or otherwise, extends to or beyond the apical foramen, in other words, involves all of the pulp remnant, there will be a radiolucent area visible in the radiogram, granted, of course, that the latter is taken correctly. The reverse of this, however, is not so invariably true. All small radiolucent areas do not indicate an inflammatory condition of the pulp tissue. Neither does root-end absorption indicate it. Instances have been found, numerically insignificant at the present time, in which, although the radiogram showed both of these conditions, not the slightest inflammatory reaction could be seen in the pulp tissue. In the absence of sufficient data, all such cases should possibly be looked on with suspicion and disposed of as the demands in each particular instance seem to indicate. It is in these cases that the most careful judgment must be exercised.

The next feature which is worth while mentioning and which bears directly on the last is the strong evidence that some, at least, of the steps that constitute a good technic have been sadly neglected. This neglect consists of failure to (1) remove pulp tissue in part or in whole; (2) prevent débris from entering the canal or remove débris; (3) clear up hemorrhages; (4) prevent the root filling impinging on the pulp tissue left in the canal, and (5) properly seal the canal in part or *in toto*. Many cases were found in which no pulp had been removed from the canal, yet sometimes two or

three guttapercha cones had been inserted down to the apex. Even where the history indicated that only the utmost care should have been exercised and was necessary for success, apparently little effort was made to do those things carefully. The whole thing seemed to have been left to luck. Pulp tissue, already doubtlessly infected and greatly irritated, was allowed to remain and be impinged on and further irritated by the root filling and débris. The inaccessibility of such canals cannot be offered as an excuse; for if one or more guttapercha cones can gain entrance, it would seem that some, at least, of the pulp could have been removed. Some of these cases lead one, not to wonder that treatment of the tooth sometimes fails, but to wonder why it does not fail more often. It should be perfectly obvious to whom that part of the problem belongs.

It is remarkably indicated in these specimens on every hand, how much infection, reinfection and injury the pulp will stand for. As has just been said, it is remarkable that more do not succumb if they are like those that have been examined. Obviously, the resistance of the pulp must be far greater than has heretofore been thought. That there is a relation between the technic and success and failure cannot well be denied, but just what that relation is, it is difficult to determine. In the failures and successes studied, the evidence of poor technic is about equally divided. The outcome, all things being equal, probably depends largely on the character of the pulp tissue before treatment is undertaken. For instance, a tooth with a history of pulpitis of some duration, treated incorrectly, would be in much more danger of failing than one without such a history. Such cases have been observed, and, in each, there existed either an acute inflammation indicating immediate danger, or else suppuration had already set in. On the other hand, in those instances in which the pulp remnant had remained normal for periods up to twenty years, the indications were that treatment had been carefully carried out. The root filling did not impinge on that pulp remnant, and the canals had been well cleaned and sealed up to the main body of the pulp remnant. This all seems to lead to the conclusion that, given fair conditions to start with and a careful painstaking technic, pulp tissue should remain healthy and innocuous.

This, then, is the extent of the histologic findings relative to the pulpless tooth, at the present time. Principally, it indicates that

1. All pulpless teeth are not infected or are not an immediate source of danger.

2. The changes that the pulp remnant may undergo, being analogous to those resulting in scar or regenerated tissue in general, should not render the pulp any more susceptible to infection than is such tissue.

3. As large amounts of pulp tissue have reacted favorably to infection and injury, or at least are momentarily inert, little worry need be expended over accessory canals.

4. It is not wise to assume that the partial removal of pulp tissue, even when the history is favorable, is justifiable. Short of injury to the periapical tissues, all that possibly can should be thoroughly and painstakingly removed.

5. If conditions are favorable, and if technic is properly carried out, it should be possible to treat teeth with involved pulps successfully and safely. It remains to be decided under what conditions they may be considered favorable, and until such a time, judgment and experiment must guide.

6. Until further data accrue, all radiolucent areas, no matter how small, should be looked on with suspicion and should be obliterated with careful judgment as the circumstances may demand.

7. Much more cannot be accomplished in the field of histopathology until, with the cooperation of the careful clinician, a study of material with a fixed and definite history is made. It is to be hoped such will be forthcoming soon.

DISCUSSION

Edward H. Hatton, Chicago, Ill.: The two papers on the program this morning correlate themselves. Indeed, it is hard, from the context alone, to tell which is the clinician and which is the histologist. On the other hand, if we trace the gradual development of the subjects in the program of this section, there are places in which there is a considerable variance from the ideas that we have had presented today. Because I am in full sympathy with the opinions and ideas of the men on the program to whom you have just listened, I am much more inclined to study them critically and if possible show that they are not justified. Both the clinical results of pulp canal treatment and the histologic pictures of the apices of teeth that have been treated are, however, evidences in favor of this form of therapy. All through the program of this meeting, there is a strong current of conservatism, and I am wondering if there is not danger in this attitude. I am not afraid of the enemies of this conservative trend, but I am worried about our friends; indeed, I am concerned about the whole pulpless tooth problem. Worried because I am positive that it is not going to be settled in meetings such as this one, and equally positive that it is not going to be decided in the laboratory or in the teaching clinics. It will be decided in the dental offices of the rank and file of our profession. Not in offices such as of those of Dr. Coolidge, where there is every provision that ingenuity can devise to safeguard every step of this delicate operation; but in offices, in many instances, far from the supplies of the refined drugs that should be used when drugs are called for, and in which the instrumental equipment and the means for sterilizing instruments are quite inadequate, as usually used for this type of operating. A failure on the part of the dentists practicing in this type of office to make good in this operation will, I fear, again condemn this procedure, perhaps unjustly, but nevertheless effectively. It is this feeling that leads me to hope that all who treat and fill pulp canals in the near future will do so conscientiously, conservatively and with careful consideration of the cases that actually merit the attempt. Now may we consider some of the specific statements that have been made by Dr. Coolidge and Dr. Skillen. "We are dealing with human, living tissue in root canal treatment," and farther on "Nondestructive drugs which are powerful antiseptics should be used, such as cresol, cresatin, dichloramin-T, beechwood creosote and iodin." Do these two statements harmonize? They may: it depends on how these drugs are applied and used. Another essayist yesterday went farther than this in the list of powerful drugs proposed for use in pulp canals. Note the terms "nondestructive" and "powerful antiseptics," and let us think in terms of iodin: is it nondestructive? One of my classmates, when an intern, in preparing his first patient for operation, used full strength, 7 per cent iodin to paint the abdomen. Not quite satisfied that he was thorough enough and calmly confident in his belief in iodin as a nondestructive drug, he placed some on a dressing and strapped it onto the abdomen until the next morning. No one can convince me that iodin is always a nondestructive drug. Yet used in weaker solutions and under certain definite limitations, it is not destructive; not only nondestructive it may even be a tissue stimulant, and this last fact reconciles the two quotations. The difference in the use of a single drug may determine success or failure in root canal treatment. Another quotation: "To determine what teeth should be saved and what teeth should be extracted is a problem that demands the greatest attention and the use of every aid at our command to dif-

ferentiate properly between the pulpless teeth that are operable and those which are not operable." Compare this statement with those that I have heard and read concerning the choice of teeth to be treated and filled, the sort of statements I am sure that all in this audience have heard over and over again. The only comment that I can think of that is applicable, granting that Dr. Coolidge is right, ends with "where angels fear to tread." Yet the average man is much more likely to accept the advice of the man who claims that by his method, he can treat successfully 90 per cent or more of all the cases that come to him than that of the clinician who suggests that the choice be made wisely but not too often, and in this chosen group, attains success in 90 per cent of the cases he treats. The average man is an optimist; instinctively, he selects the counsel of the man who promises the most. All of us would invest in gold mines rather than in government bonds and only after bitter experience do we repent. Let us have no bitter experiences with the teeth we select to treat and fill. Again I quote "Over a period of years, the highest percentage of success has been obtained in the treatment of pulpless teeth without periapical disease." There is not much to be said about this, because it is what one would expect. But would it not be better for the average operator to treat more of these and fewer of those in which there is already disease at the apex? I am sure that from the data presented by Dr. Skillen and previously by myself, there is not only suggestive evidence as to why this is so, but there are also a few clues that may help in the selection of the cases that may respond to treatment. There are two constantly recurring conditions illustrated in Dr. Skillen's radiograms that amaze me: one is the reconstruction of the region of the apex in the face of what would seem to me overwhelming odds. This much is hopeful. The other is the scarceness, from the histologic point of view, of good root canal fillings. If the specimens that he has been collecting are average samples of root canal fillings, it is high time that our technical methods were improved. The canals are poorly cleaned out, are only partially filled transversely and there are frequent evidences of blundering instrumentation. On the other hand, the clinical results obtained by Dr. Coolidge and others suggest that there is in existence a different brand of technic. It is, of course, true that these studies of Dr. Skillen's were made on extracted human teeth, and I have yet to meet the person who has been willing to sacrifice a serviceable tooth in order that I might see, histologically, a successful root canal filling. Treatment of these teeth that we have been studying is in all cases a failure, for some reason or other. If even in spite of this, we can find such a considerable percentage of apical regeneration, it is hopeful, and inclines us to accept Dr. Coolidge's figures with some degree of confidence. I cannot see any reason to question Dr. Skillen's statement that the diagnosis of inflammation by the histologic method is more certain than by the bacteriologic. At least, if not more accurate, it is more conservative. Since all inflammation is not bacteriologic, it may be chemical or mechanical trauma that has induced it. His method is much more promising than the bacteriologic, since, in every case examined by him, he has a good opportunity to disclose the reasons why the treatment has succeeded or failed. There are two methods of approach to the solution of the treatment and filling of pulp canals, the clinical method as adopted by Dr. Coolidge and the method used by Dr. Skillen. The more closely the two lines of investigation can be interwoven, the more likely are we to arrive at the truth and determine the causes that control both success and failure. In the meantime, we can do the cause the greatest good by proceeding cautiously. It must not be forgotten that the critical point in the root canal filling is at the surface of contact between the filling material and the vital tissues at the apex and that in the reaction of the tissues there is the key to the situation. If it is favorable, the operation will succeed; if not, it will be a failure.

MOUTH PREPARATION FOR THE RECEPTION OF DENTURES*

By FREDERICK F. MOLT, D.D.S., Chicago, Illinois

INADEQUACY OF SO-CALLED SIMPLE EXTRACTION

OLDER methods of extraction, dating back to the barber and his turnkey, which had only one objective—the removal of the offending tooth, or at least the visible portion of it—are not sufficiently comprehensive for the requirements of present-day scientific denture construction. Not all dentures are by any means scientifically made, any more than are all extractions properly performed, but in this consideration of the subject we will assume that one should complement the other. Various factors must come in for preliminary consideration—the complete eradication of infectious foci, the immediate or practically immediate insertion of dentures, the retention of facial contour and dimensions, the comfort of the patient both after operation and while the dentures are being worn, and last, but by no means least essential, the restoration, in as great a degree as is possible, of masticatory efficiency.

Few patients voluntarily submit to or resort to dentures. To most of them, the adoption of the artificial denture marks a dead-line between youth and old age. When it becomes unavoidable, because of, or in spite of, continued and inadequate dental care, there is usually a medical aspect to the case as important as the dental factor.

The pulpless tooth, albeit recently painted white as the lily and utterly harmless, will still have to be eliminated when the overload has brought about a crisis. This elimination calls primarily for the extraction of the entire tooth and, moreover, the extirpation of existing periapical or residual pathologic tissue masses or cysts. "Wing shot" extraction procedures are seldom adequate, although on the surface they may appear so. If one is to make an honest effort to work out every phase of the problem, such methods as the individual case demands should be utilized. In many cases, only the open-view procedure, or alveolectomy, will accomplish a thorough and altogether desirable result. And even though, as in all departures from precedent, this type of surgery has been vehemently opposed, it has become an accepted method. To quote George Bernard Shaw, "Every great orthodoxy was once a heresy;" and this bids fair to be quite true of this procedure. This is not one of the methods that the dentist loves—a short cut or a time-saver—quite the

*Read before the Midwinter Clinic of the Chicago Dental Society, Jan. 27, 1926.

contrary; but for those who take their work sufficiently seriously to be willing to devote additional effort to doing things thoroughly and properly, the open-view operation presents infinite possibilities.

Obsolescent methods comprehended the catch-as-catch can extraction of the teeth. Pathologic lesions were ignored. "Process reduction" was principally unintentional, and as frequently took in the lingual plate of the process as the labial, often most of the overlying tissue as well. The patient was turned out on the world to live through the protracted healing, and to "gum it" through a longer period, waiting for absorption, if any resulted. Some hardy souls with Spartan stoicism could bear the insertion of so-called "temporary teeth," during the long waiting period, these usually overcumbersome, changing the patient's appearance vastly and worn, with little pleasure, upon points and knobs of underlying bony structure.

PRELIMINARY STUDY OF THE CASE

A present-day routine, idealistic, yet readily established, would comprehend a preliminary study of the case, with adequate radiographic and clinical examination, study models and measurements of the normal face. The existence of pathologic conditions is noted, abnormalities considered and the desirable amount of process reduction determined. The method of operation is then decided on, with the anesthetic agent to be used. If the case calls for open-view surgery of any extent, nitrous oxid-oxygen or ethylene-oxygen are not indicated. This reduces the choice to procain nerve blocking or a general anesthesia employing ether. Temperamental characteristics of the patient, or physical indications or contraindications, may dictate one or the other. Block anesthesia may be utilized in office work, while general ether anesthesia calls for hospitalization. Psychic shock will not permit of both mandible and maxilla being operated at one sitting under block, while ether will permit of this. Block anesthesia, of course, means that the patient will be conscious, while the general anesthetic avoids this. Block anesthesia will be advantageous in the control of hemorrhage, while any general anesthetic increases hemorrhage. Hospital postoperative care is much more desirable than dismissing the patient after an operation to whatever care he can get at home, or in his club or hotel. All of these points may be considered briefly by operator and patient.

The denture aspect of the case may then be weighed. Surgical preparation of the mouth permits primarily of such thorough extirpation of pathologic areas that the possibility of toxic reaction in very extensive or complete extraction may be ignored. This statement is based upon observation of more than 1,200 cases and, for me at least, disposes of the theory that only one or two teeth should be extracted at a sitting, with the exception, of course, of borderline cases.

ADVANTAGES OF SURGICAL PREPARATION

By surgical preparation, a predetermined, ideal shaping of the ridges may be accomplished, with the elimination

of undercuts, overly large tuberosities, bony excrescences in the palate or on the lingual aspect of the mandible, all prominences of process and all loosened fragments. In addition to this, all root fragments are definitely extracted and pathologic areas curetted without invasion of such adjacent structures as the nasal floor, the antrum or the inferior dental canal. The coaptation of tissue flaps over the shaped ridge and the suturing brings about the exclusion of saliva and bacterial contamination, achieving rapid and, in comparison, comfortable healing.

The denture construction is bettered by the utilization of this method in many respects. The immediate insertion of the dentures prevents the loss of muscle tone, function and normal facial expression. The proper positioning and ridge lap of the teeth is provided for, making it possible to reproduce the angulation and appearance of the natural teeth, as well as to accomplish proper antagonism for masticatory efficiency. Comfort in wearing the dentures is achieved because of the absence of sharp margins and points of process. The dentures are stabilized because absorption is anticipated and minimized, and because all pathologic tissue and deep-seated areas that cause continuous atrophic change are eliminated. Adaptation is made more accurate because of the absence of prominences and undercuts, which would make exact impression taking impossible or at least exceedingly difficult. A dependable peripheral seal, or valve seal is also made possible, this obviating the need of palatal "vacuum chambers." Dislodgement of the dentures is guarded against by doing away with muscle impingements, prominent frenum attachments and excess of soft tissue.

Campbell states that "if dentures are desired immediately, satisfaction with the results is rarely possible without the removal of the teeth by means of a surgical operation;" that he "has the first mouth yet to examine from which teeth and sufficient process have been properly removed by 'pulling' or 'extracting' procedures."

A large part of Wilson's "Dental Prosthetics" is given over to considering methods of impression taking and denture construction in mouths not adapted to dentures because of abnormalities, congenital or acquired, practically all of which may be entirely eliminated or greatly modified in the course of the operation here outlined. Particularly is this true of the palatal bony excrescences and those on the lingual aspect of the mandible, the enormous tuberosities, and the sharp margin of the mylohyoid ridge in pyorrhea cases.

PREPARATION FOR OPERATION

The type of procedure here suggested having been decided on, the operation is carried through, whether with general or block anesthesia, in hospital or office operating room, with the same degree of nicety and meticulous aseptic care.

White outlines the following principles of aseptic surgery, which are as applicable to oral operations as to major general surgery.

Pre-operative preparations. These consist in rendering and maintaining sterile

(1) All surgical materials that are destined to come in contact with the wound and exposed tissues or to be handled by the surgeon and his "sterile" assistants.

(2) All parts of the surgeon and his assistants that are destined to come into contact with the tissues or with the sterile instruments and surgical materials . . . .

Precautions during the operation.

(1) Neither the surgeon nor his sterile assistants touch anything that has not been rendered and maintained sterile.

(2) *Non*-sterile assistants refrain from touching or infecting anything that is sterile.

The product of a progressive growth from antisepsis, surgical asepsis is only three decades old. It is quite in contrast with older procedures both dental and medical, but is as possible of accomplishment in one as in the other. No compromise is justifiable.

The patient is prepared for operation by being draped with a sterile sheet and towels, and with the head covered. The face is washed with alcohol. The mouth is washed with an antiseptic solution, and each successive area operated on is blocked off with sterile packs, and painted with 3.5 per cent tincture of iodin.

The instruments to be used, consisting of knives, periosteal elevators, retractors, chisels, mallet, rongeurs alveolar trimmers, files, scissors, sponge forceps and hemostats, as well as the various forceps and elevators for extraction, have been sterilized and laid out conveniently upon sterile trays or tables.

SURGICAL TECHNIC

A longitudinal incision is made, following the gingiva as closely as the presence of pathologic tissue will permit. In pyorrhea cases, the incision is well below the hypertrophied tissue line.

The extraction of the teeth in certain cases should precede the raising of the mucoperiosteal flap; in others, it will be expedited by the preliminary chiseling away of the gingival buccal and labial alveolar plate, and therefore should be postponed. Bridges should be removed in the beginning so that they will not interfere with the proceeding.

The incised mucoperiosteal flap is gently loosened, raised and retracted in such a way that it will not be traumatized. The bony structures that are exposed are cut away with rongeurs and chisels to the predetermined degree, care being taken to preserve the septa intact, if possible, as they are to act both as a support for the flap and a matrix for regenerating bone.

Extensive pathologic areas may require more definite disclosure than this reduction provides, in which case a box-like opening may be made to the apex of the root or beyond, permitting an open-view and direct attack, without markedly altering the ridge shaping.

If the teeth have not been extracted, this is now accomplished by tipping them from their sockets. In the case of the three rooted upper molars, it may be desirable to follow Novitsky's suggestion, cutting off the buccal roots, lifting the lingual out with the tooth-crown and turning out the buccal roots.

At the tuberosity, the excess of tissue or bone and tissue may be so great that there is direct contact with the lower ridge. This is reduced by taking out a wedge-shaped section of tissue, doing away with the alveolar buccal undercut and bringing the flap into apposition.

Any pyorrheic tissue, or periapical or other pathologic mass is carefully but

thoroughly enucleated by the use of blade curets.

Beginning at the tuberosity, the molar and bicuspid region is prepared, the septa being shaped to produce a modified U, with the long slope toward the buccal. Little if any reduction is made of the lingual plate, other than to smooth off sharp margins, except in rare cases. The lingual tissue, if very thick, may be reduced by taking out a longitudinal wedge between the mucous surface and the periosteum which will avoid resistance to suturing.

After the desired shaping is achieved, with the rongeurs and chisels, the bony edges are smoothed with Colburn files or with alveolar trimmers so that there are no prominent margins. All débris is removed from the sockets, and if pathologic tissue has been taken away, the area is wiped out with tincture of iodin on an applicator.

The retracted tissue flap is now lowered into place and sutured without tension, the sutures being placed over the septa to avoid indentation. These two points should be accentuated. Most illustrations of alveolectomy results show the tissue flaps nicely in coaptation with many sutures. This is, of course, an ideal result in the picture, but, unfortunately, not always possible of accomplishment. If, in order to bring the flaps into apposition, tension is made on the buccal tissue, the mucous fold is lowered, perceptibly reducing the ridge height and interfering with peripheral adaptation. On the other hand, if, in many cases, sufficient alveolar structure is taken away to permit of the tissue flaps meeting, the result will be a decidedly flattened ridge. Therefore, if the flaps may be approximated without lowering the mucous fold, well and good; if not, the molar sockets may have to remain partly or entirely uncovered, to be filled in by blood clot and tissue formation.

This technic is repeated in the anterior region and in the opposite bicuspid and molar area. No vertical incision is made in the anterior unless the labial frenum attachment is so low as to interfere with the denture, in which case a diagonal incision is made on each side of the frenum, which is later carried upward and sutured. There is sufficient elasticity to the tissue flap to permit of its being retracted without the vertical incision.

The anterior portion of the ridge being properly prepared, suturing is resumed at the median line and carried each way to the cuspid region. Here, in many cases, a superfluity of tissue is present, owing to the lessened arc of the ridge. This is disposed of by cutting out a V of tissue over the septum between the cuspid and bicuspid and suturing the edges together. The procedure in the mandible is the same as in the maxilla, with the surplus longitudinal tissue cared for in the bicuspid area.

Suturing too tightly in the anterior region should be guarded against, as should also the retention of too much tissue in the flaps, or overlapping, a soft cushion on the ridge being thus produced. If the flaps are left 1 mm. apart, there will be less hemorrhage into the tissues and less ecchymosis than if they are brought tightly into coaptation. No more sutures should be used than are actually necessary to retain the flaps—it is not necessary to buttonhole the wound. I have found the interrupted suture more desirable than the continuous. No. 00 tanned catgut best

fills the requirements of a suture material.

Prominent muscle strands may be nicked and, if necessary, the wound closed with a suture.

The palatal excrescences upon which many dentures ride are approached by an incision following the median line, and the flaps retracted sufficiently to permit the use of a large gouge chisel to smooth the growth to symmetry with the rest of the palate. For the removal of the knoblike protuberances on the lingual of the mandible, it is only necessary to loosen the tissue, and, holding the finger below the mass, outside the tissue, direct a straight chisel in such a way as to cut off the knob entirely, withdrawing it with a curet.

POSTOPERATIVE CARE

Postoperative care of the case consists of hourly rinsing with a hot antiseptic and deodorizing solution, and the external application of an ice bag. If there is a marked hemorrhage tendency, calcium lactate, 5 grains, three times daily, is prescribed, and the patient is instructed to use a cold, even an ice cold, irrigating solution.

The usual diet and care of elimination are suggested.

Patients, as a rule, experience little postoperative discomfort, often expressing surprise over the fact. Compared with the disturbance frequently following so-called simple extraction of all the teeth, the rapid recovery of the patient is most satisfactory.

IMMEDIATE DENTURE CONSTRUCTION

Immediate insertion of dentures may be literal or relative. It is possible to prepare the models of the mouth as the finished operation is desired to be, and complete the dentures before operation. Models are then taken from the dentures and these are followed as closely as possible in the surgery, after which the dentures are inserted at once and worn continuously.

A variant of this is to prepare what Campbell calls occlusal rests, base plates holding the jaws in their normal relation and acting also as splints. Both of these methods seem really to limit the swelling and are not, as would be expected, the source of discomfort. If the dentures are not immediately inserted, a week, or at most, ten days, will suffice for thorough and comfortable healing, after which the dentures should immediately be prepared and worn.

RATIONALE OF SURGICAL PREPARATION

Criticism of the technic here outlined has emanated from two sources: from the irreconcilables who are constitutionally opposed to anything that deviates from established practice, and from those who have known little or nothing of either methods or results. Endorsement, on the contrary, has been given by those who know most about the requirements for denture foundation, the denture prosthetists. With slight deviations, it is the same as that used by Shearer, Novitsky, Lucas, Colburn, Berger, Gardner and scores of others who have rebelled at the inadequacy of the older methods in present-day requirements. Under any circumstances, it is only the adaptation of established surgical principles to a perfectly obvious problem. The arguments offered by MacMillan are simply those that had been put forth previously, and the presentation of laboratory specimens, beautiful though they are, bears no relation to the actual

situation. Although it is not possible to present a mouth in which surgical preparation has been done for anatomic laboratory examination, the statement that the removal of the outer alveolar plate interferes with regeneration can readily be contradicted by opening into any individual area operated on by open-view surgery sufficiently long ago to have regenerated. No valid argument has yet been presented.

Dean has offered us a short cut by suggesting cutting out a V of septal bone the length of the ridge and causing a green-stick fracture of the buccal and labial plate shaping the ridge. Two things that are vastly important this cannot provide for: the visible, definite elimination of periapical masses, and the reduction of overly large tuberosities or other malformations.

CONCLUSION

If cases are selected and studied, and the operation is performed with skill, thoroughness and careful asepsis, in order to accomplish a predetermined result—in short, if horse sense and surgical judgment are used, the result cannot be other than most satisfactory for both the prosthetist and the patient who does not care to advertise his dental misfortunes.

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DISCUSSION

E. L. Dunn, Chicago, Ill.: In scientific denture construction, it is obvious that some degree of mouth preparation must be made. Certain latitude of judgment in the selection of anesthesia is granted. Each operator will do his best work with his favorite anesthetic and with familiar equipment. Most nearly uniform and satisfactory results will be had by combining the extractions and alveolotomy in one operation. Hospitalization will have advantages that are largely represented in after-care. A well-equipped office will accomplish the routine operating except when the choice of anesthesia is ether. With reference to the statement that the use of nitrous oxid or ethylene is contraindicated: If a general anesthetic must be administered, and if a full mouth preparation can be made with ether, the same result can be accomplished with the other agents above mentioned. This is true, at least, of nitrous oxid-oxygen, for it is my choice of anesthetics, and the method by which all but an insignificant percentage of all operating is done in my own practice. Local anesthesia certainly appeals, with reference to the time factor, unless, with nitrous oxid, the operator uses the technic of prolonged anesthesia. Since an operator cannot be a dual personality, he must employ a trained anesthetist. I think it safe to assume that the more general use of the prolonged nitrous oxid-oxygen anesthesia would be gratefully welcomed by the majority of patients; also, that the reason it is not more generally used is simply that the operating dentist will not take the trouble to acquire either the technic of this anesthesia, or the operative technic, which is likely to get on his nerves until acquired. Surgical procedure, as presented by Dr. Molt, conforms to accepted usage. He suggests that the final suturing may well be done conservatively and not "button-holed." I note this especially for it is my observation in experimenting with a number of prepared mouths, that the utter lack of suturing was followed by the same rapid healing which is characteristic of careful trimming and shaping of alveolar process. I do not advocate entirely the omission of sutures. However, much of the raised tissue flap will lay back in place securely, being aided by the adjacent tissues and the blood clot. The frenum can be entirely removed to good advantage and a suture placed at the reflection of the mucosa. This will leave a smooth surface on the mucous membrane of the lip.

R. R. Gillis, Hammond, Ind.: My understanding of the purposes for any special treatment of prospective denture cases has changed but little from the ideas expressed in my paper read before the American Dental Association at Boston, six years ago.[1]

1. Gillis, R. R.: A Method Affording Denture Service Immediately Following Extraction, J.N.D.A., 8:667 (Aug.) 1921.

All preoperative records are to be used for reference primarily and not for duplication in most cases. Dr. Molt mentions study models and measurements of the normal face. Please bear in mind that the facial features and mouth conditions presented today by the patient who is to become our denture patient of tomorrow usually cannot be considered normal features. Time, wear, and disease have all ravaged the normal features and we see and deal with more or less of a wreck for our study models and reference records. Hence, I say that such records as we make just prior to surgical interference are to be considered mere reference guides rather than models for duplication. The maxillomandibular relation thus recorded is not often a desirable relation to be continued—not even possible to be long continued with full dentures. Too often, such central occlusion as is found in the remnant of the patient's natural masticatory apparatus is associated with such a protrusive, or lateral-protrusive, maxillomandibular relation that we would introduce a serious error should we incorporate it in our new full dentures. If the case calls for only a full maxillary denture, the *status quo* may be duplicated and, in such a case, splendid results are obtained by making the denture in advance of the surgery. By this method, the surgeon has a definite guide in the denture itself, for his process-contour reduction. No suturing whatever is needed, for the denture that is inserted immediately after the surgical procedure acts as a matrix into which the "surgerized" tissues mold themselves most favorably. Bear in mind that any swelling following alveolar surgery appears in the adjacent soft tissues, in the labial and buccal reflexes and in the cheeks and is not incompatible with a maxillary denture immediately placed. For mandibular dentures or for full dentures, better results may be had either by making casts and establishing new maxillomandibular relations (the bite) before surgical interference or by waiting probably ten days after surgery. Dr. Molt says that "all pathologic tissue and deep seated areas that cause continuous atrophic change are eliminated." I acquiesce in the elimination of pathologic tissue, but I recognize two other far more potent causes for continuous atrophic changes and place relatively little blame for alveolar atrophy on deep seated areas—pathologic root ends. The two major causes for atrophy to which I would call your attention are (1) peripheral compression—too tight rim fit in our dentures, and (2) faulty calcium metabolism, a systemic condition. Let us secure peripheral contact without impingment, and thus avoid interference with the blood supply of the tissues under the denture borders and feed the patient on bone building foods. Thus only can we minimize the atrophic changes in the alveolar tissues. The prime factor in pyorrhea, which is only alveolar atrophy preceding extraction, is a too civilized, too refined, minerally deficient diet. Correct the food intake and thus control alveolar conditions. Diet, and not surgery, is the final answer to this problem. I would suggest that the "obviating of palatal vacuum chambers," "doing away with muscle impingments, interference of frenum attachments," etc., is a matter that may be well cared for by a proper technic in denture construction rather than by surgery. I wish to add my endorsement to the statement that "thorough extirpation of pathologic areas obviates the possibility of toxic reaction following extensive extractions." Other things being equal, we would not hesitate to operate on an entire mouth at once, excepting, of course, in much debilitated patients and in infections at the acute stage. I question any operation for the reduction of the sharp angle of the mylohyoid ridge. We can be safe in operating on the strictly alveolar tissues since the alveolar process is a transient tissue, but we must remember that the mylohyoid ridge is true bone and the seat of attachment of muscles. I would hesitate to operate in such an area not only because of its structural and anatomic nature but more so because any difficulty its contour offers can well be overcome by a proper technic of denture construction. I think an operation to reduce the mylohyoid ridge is not only questionable but entirely unnecessary. I agree in what Dr. Molt says about the anesthetic, about preparation of the operator, assistants and instruments, and, in the main, about the actual operation; but when the teeth and some alveolar process and all the pathologic areas are removed, I beg to differ. Just before closing the wound, he says, "the area is wiped out with tincture of iodin on an applicator." When we have sterilized all instruments and appurtenances, including the operator and assistants, and removed all pathologic tissue from the mouth, why should you add further insult to the

already injured tissues by bathing them with iodin? I desire the most prompt healing possible. I cannot conceive that raw tissues whose surfaces are bathed with iodin (or any other potent antiseptic or germicidal agent) can make recovery until they have first overcome the drug injury. Such an application is unnecessary after a clean operation. Any differences of opinion thus far expressed are trivial and all are easily forgiven, but I must challenge Dr. Molt on his outline of postoperative care. He says, "Postoperative care consists in the hourly rinsing with a hot antiseptic and deodorizing solution and the external application of an icebag." What would you think of an abdominal surgeon who would advise such a procedure after operation? And yet we oral surgeons claim to follow closely in the technical and aseptic footsteps of the brilliant general surgeons. Man has never devised a better barrier for any wound than Nature's blood clot. "Wash hourly—" unthinkable. Leave it alone; give Nature a chance. "Wash hourly;" yes, if you wish to interfere with prompt healing; if you wish to delay healing, increase after pains and invite complications. Washing, irrigating, flushing the mouth has been forbidden in our practice "until sometime tomorrow" for the past ten years. The bettered results justify these statements. We want a firm blood clot to organize quickly; hence, the area is left strictly alone. I know this is diametrically opposed to the practice of most dentists and to the advertising propaganda of the makers of liquid mouth washes. Nearly all patients have been trained through the years to expect the rinsing after-treatment. They expect something to be done for the poor injured mouth. But when we explain that the wound must not be tampered with and Nature alone can secure the best results promptly, they understand. After pain is not from surface lesions; it comes from lesions adjacent to nerve trunks or from exposed boney walls. A good blood clot takes care of the covering of boney walls provided we have not used too high a percentage of epinephrin with the anesthetic solution. Postoperative pains are not effectively controlled by surface applications and alveolar socket tampons are a nuisance because of the necessity of frequent renewals. How would we control or relieve postoperative pain? By internal administration of sedatives—the only method which does not offer interference in the local field of healing, and the only method which reaches the deep seated pains. Icebags? Yes; when we desire to reduce circulation to the parts, but why reduce circulation and thus delay healing? You say "my patients want to avoid swollen faces so we direct the use of icebags and cold compresses." Nature effects her healing by throwing extra blood and lymph into the parts. Of course, the surrounding tissues swell to accomodate this extra bulk. That is as it should be. Teach your patients the purpose of such a swelling; that they should not interfere with it; that they may expect swelling but should do nothing to obstruct Nature's plan of healing the wound. Neither hot water bags nor icebags have any place in our postoperative procedures. Leave the field of operation alone. Control pain only by internal administrations—and your patient will find any inconvenience minor and transitory. "It is only the adaptation of established surgical principles to a perfectly obvious problem." Established surgical principles" — "established" — made stable, firm, fixed, immobile. Surely the meaning would be better expressed by omitting the word established. We prefer and desire principles or practices less fixed; living principles, yet capable of further development—that may someday bring recognition of the heresies we voice today as the orthodoxy of tomorrow.

Dr. Molt (closing): Apparently Dr. Dunn's opinion and mine coincide, with but one exception—the advisability of attempting such an operation as here outlined under nitrous-oxid oxygen. I have tried it with the most capable anesthetists it was possible to obtain, both in my office force and outside. The only type of nitrous-oxid oxygen anesthesia that I think could readily be adapted to this procedure to permit of the ideal results I have here outlined and that I demand is that I saw in London this past summer in Gillies' clinic. This anesthetist carried a rubber catheter through the nose and nasopharynx into the larynx, and produced an even, smooth, anesthesia not possible to obtain with a nasal inhalor no matter how carefully the throat may be packed. You will note that I have qualified my statement by saying "the ideal result." There is no doubt that débris not removed at the time of operation will later be exfoliated. There is equally no doubt that many of the periapical masses will

eventually be absorbed if one cares to take that chance, but I prefer to know, when I close the flaps in the operative case, that the case is prepared to the best of my ability; that there is no remaining pathologic tissue and there is no débris. Nitrous oxid as usually administered is not adequate for such a result; hence, the resort to ether or block anesthesia. With regard to the entire clipping of the frenum: this should be studied in the individual case. The indiscriminate clipping of the frenum will in some cases change the entire shape of the upper lip and in others cause the patient to show more of his teeth and of the denture than he should, or than he wants to. Dr. Gillis has picked out two or three insignificant points and made much of them. I know that we agree in the main points, because this is not the first time that we have discussed the same subject. I think I can curet out a granuloma as completely as "the next man." When I have lifted away this mass, I feel a little comforted by wiping out this area with 3.5 per cent iodin. To say that this is harmful is ridiculous. Dr. Gillis has done that not unusual thing—taken a half sentence away from it context, so that it loses all its original meaning, and then commented on it. With regard to postoperative washing and the use of the icebag, I am quite willing to compare results at any time, if that is any criterion as to the efficacy of the two methods of treatment, postoperatively. Quite naturally, there are many extraneous points that might have been touched on—the calcium metabolism theory, study models, etc. Price has given us much of value on calcium, and surely the denture prosthetist should be interested in knowing whether it is possible to improve the quality of the ridge, for thereby he would be benefiting the patient. I differ with Dr. Gillis as to the possibility of relieving a denture over a knife-edged mylohyoid ridge. There are a vast number of cases in which no denture can be tolerated over this edge, relief or no relief. In such cases, the only possible recourse is operative interference. The successful carrying through of many such cases, severe though the operation is, makes me feel that Dr. Gillis is conjuring up a bugbear that does not exist in actuality. Aside from that I think we may reconcile all our small differences.

THE RELATION OF INFECTED TEETH TO EYE DISEASES*

By ROBERT H. BUCK, M.D., D.D.S., Chicago, Illinois

AS the subject of this paper was not of my own choosing, but was assigned to me as a topic for discussion, I approach the task with a good deal of temerity, since such a consideration involves encroachment on several extensive fields of scientific research, each one of which has been carefully and painstakingly worked in by highly trained observers.

Beginning in 1909, both the medical and dental literature has teemed with excellent reports of highly scientific investigations, based upon careful analyses of hundreds of cases and extensive laboratory experimentation, pertaining to the subject of focal infections. Out of this voluminous literature, it is now possible to draw some enlightening conclusions, although the conviction is borne in on one that a vast amount of work remains to be done.

Pathologic bacteria have been injected into animals and like strains of organisms recovered from metastatic infections set up by them.

Organisms from a case of acute infection in the human being have been shown to produce like pathologic lesions in analogous organs when injected into animals; a process known as elective localization.

The theory has been promulgated that certain types of bacteria, notably *Streptococcus viridans*, undergo peculiar changes in their characteristics which determine their selectivity of certain tissues, whereby different strains of the same type of organisms set up different pathologic processes; and that they lose these characteristics when transferred to a different environment without undergoing changes either in structure or in cultural reactions.

As to the agency by which metastatic pathologic processes are produced, two theories have been advanced: one that they are due to toxins elaborated by the primary focus, the other that they are caused by bacterial invasion or by emboli carried by the blood stream. The consensus at the present time seems to favor the latter hypothesis, notwithstanding the fact that various types of orbital and ocular metastatic infections are prone to clear up promptly after the elimination of the primary focus. Is it possible that the immunizing agencies of the body, relieved of the necessity of combating the infection in the primary focus, are free to offer a greater offensive against the metastatic focus?

Structural and vascular changes in tissues prone to metastatic infection, whereby their resistance to bacterial invasion is impaired, are contributing

*Read before the midwinter clinic of the Chicago Dental Society, Jan. 27, 1926.

factors in the determination of secondary inflammatory lesions.

In the light of the vast amount of scientific research done by the dental profession, I should be presumptive to venture into this field before this body. In reviewing some of this work, the conviction is borne in on one rather forcibly that ophthalmologists would do well to consult the dentist before formulating any opinion regarding the strictly dental procedure indicated in any given case of metastatic ocular infection.

While the roentgen ray has been of immense importance in the advance of knowledge of dental pathology, the conviction has become definitely established that proper interpretation of a dental film by a well qualified dentist is absolutely essential in making a diagnosis of pathologic conditions. It has recently been shown that radiograms of the same tooth taken from different angles disclose widely differing conditions. This again impels me to admonish my confrères in the ophthalmologic branch of the profession not to attempt invasion of the field of dentistry nor to rely solely on the radiologist's interpretation of a dental film in a case of metastatic eye lesion.

I find myself called on to so coordinate this fund of material as to form a working basis, but as it is not possible within the scope of this paper to take up all phases of this subject, the effort will be confined to the evaluation of the various etiologic factors of eye diseases attributable to focal infection to determine the extent to which dental infections should be held responsible.

It is, of course, natural and logical that the ophthalmologist should consider the conservation of eye-sight paramount to the preservation of teeth, and more especially to infected teeth. The modern dentist, with his knowledge of the importance of a complete dental arc to the physical well-being of his patient, is loath to consent to the loss of any single member until he is convinced of the imperative necessity of such sacrifice by the establishment of a definite causal relation between the suspected tooth and the ocular disturbance.

We are thus confronted with the realization that, in any given case of ocular disease of focal origin, the search for etiologic factors must comprise a thorough, systematic physical examination; that all possible causes of the disturbance should be carefully investigated and, so far as feasible, eliminated before the sacrifice of any organ is considered. A wholesale sacrifice of teeth, tonsils, sinuses, appendix, gallbladder, etc., in the effort to eliminate the seat of focal infection is, to say the least, unscientific and indefensible. It is, unfortunately, frequently impossible to eliminate all other possible causes of ocular disease before requesting extraction of a tooth because of the serious damage to the eye that might result from delay.

Syphilis is by far the commonest cause of inflammatory ocular affections in general, following which are focal infections.

Tonsillar inflammations and abscesses have certain characteristics that serve as an aid in differentiating them from other types of focal infection. Because of the fact that the normal function of the tonsils is to safeguard the body from certain types of organisms, no other protecting agency is provided; hence, when organisms from a tonsillar infection are thrown into the

blood stream, any metastatic inflammation set up by them is of a more or less acute inflammatory type. Such invasion of the blood stream is usually characterized by a marked leukocytosis and enlargement of the regional lymph nodes.

Infections of the teeth are more insidious in development and the natural processes for combating infection are more or less successful in preventing invasion of the blood stream for some time. The virulence of the infection is, of course, a factor in determining the success or failure of the isolating and immunizing process, but in general it may be said that the infectious material thrown into the blood stream from this source is far less active than that from the tonsils, and hence the metastatic inflammation set up is usually of the subacute or the chronic type.

The sinuses, being walled off by bony structures, and having adequate drainage, are even less likely to be the source of focal infection than are the teeth, and too, because of the long period of development of these infections, the virulence of the infecting organisms becomes somewhat attenuated and the resultant metastatic infection is usually of a chronic degenerative type. Such secondary infections are often brought about by contiguity of the sinuses to the eyes. These ocular lesions are apt to be obscure disturbances of the interior of the eye, such as choroiditis, retinitis and uveitis with vitreous opacities. Not infrequently, sinus infections cause a disturbance of muscle balance, which is not, however, due to metastatic infection but is a reflex phenomenon.

Of the other sources of focal infection mere mention can be made here. Suffice it to say that metastatic infections of the eye from foci in the appendix, gallbladder, urethral tract, etc., and those complicating acute infectious diseases, tuberculosis and gonorrhea, are relatively rare, but that, in the physical examination, each of these diseases must be given due consideration.

Eye diseases that may be attributed to infected teeth fall into two general classes: (1) those resulting from invasion by bacteria or toxins: (*a*) acute inflammatory, such as acute conjunctivitis, orbital cellulitis, dachryocystitis, dachryo-adenitis, episcleritis, superficial keratitis, corneal ulceration iritis and iridocyclitis; (*b*) subacute and chronic, such as keratitis (parenchymatous, deep and sclerosing), sluggish ulcers of the cornea, insidious iridocyclitis, choroiditis neuroretinitis and perivasculitis; (2) reflex manifestations of irritation of the dental branches of the trigeminal nerve.

Of the ocular and orbital inflammatory lesions, by far the most common is iritis, and its manifestations in relation to focal infections may be taken as typical of all. Preceding the work on focal infections, the one etiologic factor of iritis that had been definitely though empirically determined was syphilis, and it was generally conceded that this was the exciting agent in more than half of the cases. The rest were classed as rheumatic, traumatic and idiopathic. While the various infectious diseases were held responsible for many of the so-called rheumatic cases, little or no mention was made of the possibility of infected teeth or even diseased tonsils as a possible source of the infection.

Tonsillar infections are probably the most frequent cause of iritis. Infected

teeth rank as a close second, while syphilis is relegated to third place. These three are the responsible etiologic elements in approximately two-thirds of the cases. This classification has reference to the cases as seen in private practice and is made advisedly, due cognizance being taken of the fact that it does not hold true in clinical practice when the cases are drawn from dispensaries and charitable institutions, the reason being that, among the latter group, syphilis is more prevalent, while extensive dental restorations, as done in the past, involving the devitalization of teeth and the treatment and preservation of infected teeth, are more common in the former group.

In some of the observations reported, it was strikingly evident that a large percentage of the cases presented a combination of two or more foci any one of which might have been the cause of the iritis.

The iritis of tonsillar origin is likely to be an intensive inflammation of rapid development, with photophobia and lachrymation, contraction of the pupil, marked engorgement of the blood vessels of the iris and cloudiness of the anterior chamber due to precipitation of exudates. It is accompanied by violent pain and systemic symptoms, and decided diminution of vision. Such a condition is really an iridocyclitis, since the deeper structures of the uveal tract are invariably also involved. A similar picture usually obtains in the cases complicating acute infectious diseases and gonorrhea.

Iritis due to dental, sinus or syphilitic infections is frequently insidious in onset, pain is not so severe, vision is but slightly interfered with, lachrymation and photophobia are slight and the iris and anterior chamber are relatively clear. The essential features of this type of iritis are the contraction of the pupil and the formation of posterior synechia.

Episcleritis, the etiology of which has always been more or less obscure, is another of the eye diseases that will no doubt become much more amenable to treatment now that it has been classed among the diseases due to focal infection.

Uveitis, which has been considered a manifestation of syphilis in the large majority of cases, is one of the conditions in which little has been definitely determined as to etiology. It is my firm conviction that, with the increase of knowledge of focal infections, this, like iritis, will be found far less frequently in the class of syphilitic manifestations than in the past, and that focal infections and the acute infectious diseases will account for the occurrence of the trouble in a large percentage of the cases.

Perivasculitis is frequently associated with sinus involvement, but there would appear to be no logical reason why this, too, might not be a metastasis of dental origin, as might also some of the cases of neuroretinitis.

Recently, a rather rare and interesting case of dacryo-adenitis, reported by Foster, was found to be of dental origin and subsided promptly on the removal of the abscessed teeth.

Keratitis, of which there are many varieties, is one of the most formidable eye lesions that the opthalmologist is called on to treat. Because of the permanent loss of vision resulting from destruction of corneal tissue, it becomes imperative that the process be arrested without delay. That many of these

cases are aggravated by the presence of focal infection in the mouth or elsewhere is unquestionably true, and it has long been recognized that some of them are metastases. Owing to the fact that the cornea normally contains no blood vessels, its resistance to bacterial invasion is much less than that of vascular tissues. Its nutrition is supplied by fine lymph channels, and these, nevertheless, are also subject to invasion by bacteria. Most corneal infections result from a rupture of continuity of the protective epithelial covering, the infection then entering from the conjunctival sac or being carried in by an invading agent. There remains the cases of keratitis profunda, sclerosing keratitis and interstitial keratitis. The last has come to be looked on as an almost definite manifestation of syphilis, but further study may bring the focal infections into the category of etiologic factors in these conditions also.

Of the possibility of focal infections being etiologic factors in glaucoma and cataract, so little is definitely known that one is not justified in drawing any conclusions. That such a connection may exist seems altogether within the realm of possibility, and, no doubt, future investigations will bring out some interesting features of this subject.

Reflex ocular manifestations due to irritation of dental branches of the trigeminal nerve have likewise been the subject of considerable study. They may be grouped into three classes: 1. Asthenopia of a baffling character, persisting in spite of careful accurate refraction under atropin and properly fitted glasses. This is often due to reflex interference with the normal function of the ciliary muscles. 2. Imbalance of the ocular muscles, ptosis and disturbances of the function of the orbicularis caused by spasm or paralysis of the oculomotor, supra-orbital or palpebral muscles superinduced by reflex disturbances of their nerve supply. 3. Nutritional and vasomotor disturbances.

Any of these conditions may result from infections involving the peridental membrane, from impacted teeth or a combination of both, causing irritation of the dental branches of the trigeminal nerve.

Acute reflex ocular pain occasionally results from the presence of an irritated live pulp or exposed sensitive dentin.

CONCLUSIONS

1. An exhaustive diagnostic examination should be made in every case of an eye affection in which focal infection is suspected to be the cause.

2. Decisions as to the advisability of any mutilating operation are justified only in consultation with men specially qualified to determine the existence of a pathologic process inimical to the health of the patient.

3. Dental infections have been definitely shown to be etiologic factors in many inflammatory eye lesions, and, in obscure ocular diseases, the dental factor must always be taken into consideration.

4. Reflex ocular disturbances are frequently caused by irritation of the dental branches of the trigeminal nerve.

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DISCUSSION

Frederick W. Merrifield, Chicago, Ill.: A better understanding has come to exist between physician and dentist. The former appreciates the possibilities of dental pathology and is becoming more and more dependent on the dentist for the proper interpretation of dental radiograms, and prob-

ably, more important still, a diagnosis of the oral condition gained from a thorough mouth examination such as only a competent dentist can make. Unless the interpretation of a radiogram is made with judgment and a complete knowledge of the vagaries accompanying film exposure and development, we are scarcely justified in condemning a merely "suspicious" tooth. I am in absolute agreement with Dr. Buck in his contention that the conservation of eyesight is paramount to preservation of teeth, and I think that no dentist would fail to appreciate the necessity for immediate cooperation in the cases in which such calamity threatens and delay ends so disastrously. As dentists, we should appreciate the possibility of ocular disease the result of a focus of infection in the mouth We should bear in mind the probability of reflex eye symptoms the result of irritations to the fifth nerve. The removal of these exciting causes, be they impactions, obscure caries, a sensitive condition of necks of teeth or pus in the pockets, the results of detachments of the peridental membrane will serve to show the medical profession that we examine our patients in as able a manner as we expect them to and that the cooperation they expect from us is not lacking. A bold person indeed would be the one to take a stand against the theory of focal infection. The application of the theory in an injudicial manner can be critized, and the unconsidered removal of teeth without the corroborative influence of the systematic physical examination and the coordination of the information obtained is to be decried. On the other hand, we as dentists should practice so that the health of our patients is our first consideration. The prolongation of the life of a tooth often carries with it the penalty of the possibility of menace to the general welfare of the individual. The timely removal of teeth has in countless cases been the factor in relieving secondary infection. In other cases, such procedure has been the means of restoring to the healthy vigorous enjoyment of life persons who, neither sick nor well, are unable to believe that life is worth living.

Vernon M. Leech, Chicago, Ill.: Oral surgeons, as a group, appreciate the significance of dental infection as related to its effect on other body organs. They know that focal infections are the causative factors in many damaging diseases, and so are prepared to remove the sources of trouble which come within their scope. If all cases of eye disease believed to be due to oral infection could be brought before extraction specialists for examination and treatment, there would be no uncertainty concerning the elimination of septic material from this source. But in many instances the so-called family dentist is the man who is depended on to pass judgment on the condition of the teeth. A reliable opinion could be more safely given by the latter provided he would show sufficient cooperation with the medical man who has the secondary diseases to cope with. Such cooperation is possible only when the dentist is fully aware of at least some of the many serious conditions for which infected teeth are held responsible. An intimate knowledge of the pathology of these diseases is not a necessary requirement, but opportunity should be given to observe cases in which the etiologic factor is attributed to dental infection, and they should be enabled to see for themselves the rapid rate of recovery after removal of the primary lesion. I believe, then, that there would be fewer instances of patients being returned to the oculist with a verbal O. K. as to the condition of their teeth, without so much as a roentgen-ray examination having been made. In many cases of ocular disease, it is my habit, as a routine measure, to order radiograms from a laboratory, and, with the aid of the enclosed report, check over the teeth as best I can, and instruct the patient definitely that certain of them must be removed. This is encroaching on the field of dentistry, and it will be a happy day when the responsibility can, with safety, be laid on the shoulders that should bear it. It may not be the ideal thing, to insist on removal of all infected teeth the moment they are found, but when an eye is at stake, especially in cases of rapidly spreading ulcerative processes of the cornea, severe acute iritis and uveitis, I believe there is sufficient justification for urging eradication, as far as possible, of all foci of infection, in the order of their importance, as soon as they are found. Abscessed teeth are common offenders and they can be removed with little discomfort and inconvenience to the patient; hence, it is only right to get rid of the easiest and one of the most prominent sources of trouble first. It is gratifying indeed to note the large percentage of cases in which we obtain a rapid diminution of

ocular symptoms, culminating in practically complete restoration of the organ, after extraction of diseased teeth.

Edward H. Hatton, Chicago, Ill.: Of the various diseases of the eye mentioned in Dr. Buck's paper, probably the one that has been most frequently discussed with reference to infected teeth is iritis. The theory of focal infection introduced a new etiologic factor in the solution of the origin of iritis in any given case. While such primary foci may be found in the teeth, this is only one of the locations for them. Perhaps no more accurate attempt has ever been made to study the focal infection phase of the etiology of iritis than that of Irons, Brown and Nadler. In the group of cases studied by them, only a comparatively small percentage had their origin in the teeth rather definitely established. But the interesting observation made by these investigators was that, when the blame could be rather definitely placed on infected teeth, the effect of removing this infection was most promising and effective, more so, indeed, than by the treatment of any other primary focus in the body. What has been shown to be true of iritis is probably true of the other diseases of the eye that may be secondary to disease elsewhere. Not that the mouth factor has been or will be found to be strikingly high, but the results obtained by the eradication of mouth infection when it is the primary factor will be followed by more striking successes. I cannot add to the substance of the statement beginning with "We are confronted with a realization that in any given case of ocular disease, the search for etiologic factors must comprise a thorough, systematic physical examination." Or to that of the paragraph that precedes it. I do not see how any clear thinking man can place a greater value on a tooth or, indeed, on all the teeth than even a single eye. If we grant, at all, the menace of a focus of infection to the eye, we must admit the validity of Dr. Buck's contentions. It is evident, therefore, that the type of cooperation demanded by physicians and ophthalmologists requires not only some sacrifice of the principles of conservation in the mouth but also a familiarity with the mechanism of the causation of disease on the part of the dentist. In other words, as dental consultants, they do not want mechanical dentists but dentists who are somewhat familiar with oral pathology and are, therefore, capable of recognizing dental infection and equally capable of completely eliminating it without undue sacrifice of dental and oral structures.

CONSERVATION VERSUS DESTRUCTION*

By HERBERT A. POTTS, D.D.S., Chicago, Illinois

THE alveolar process is an organ designed as a supporting structure and should be retained, if possible, in its entirety after the extraction of teeth.

Artificial dentures are retained by atmospheric pressure, and it is desirable that it be active over the greatest area possible. The physiologic processes of the body remove all the bony process that should be removed, and the result is far better than can be accomplished by instrumentation. The most satisfactory bases upon which to construct artificial dentures are those which have developed after the teeth have been extracted and temporary sets of teeth have been placed upon them within two or three weeks. It is comparatively rare that jaws need surgical treatment after teeth are extracted, and if dentures are placed as soon as the gums are healed, the process of absorption is stopped and the largest ridge maintained. The stimulation of the used plate prevents further absorption of the alveolar process.

I refer in these statements to mouths that have retained a goodly number of teeth and not to those in which there are only a few teeth, which have been retained long after their neighbors have been lost and with which no dentures have been worn. Such mouths show an abnormal absorption of the process as there has been no stimulating stress afforded by the pressure of plates during mastication; stress which alone prevents an undue absorption. As broad surfaces make tightly fitting plates possible, why should one diminish that surface by cutting it away?

The majority of mouths need no meddling preparation for dentures, and I see no valid reason why the patient should submit to a dangerous operation just to make it easy for the dentist to construct a denture. Long before the desire to cut, file and grind bone and cover up iniquity by suture of the gum tissue developed, most dentists did all the surgery necessary by nipping off sharp and projecting processes, with the result that the patient had less discomfort and pain and better bases upon which to build dentures.

Because the extraction of a tooth or teeth is frequently the cause of grave systemic disorders, it should not be looked on lightly. The periosteum should not be elevated from the bone, and, after the tooth is out, the gum should present a normal appearance, showing just the hole from which the tooth came, and not presenting the torn, lacerated, macerated condition so fre-

*Read at a joint meeting of the Virginia and North Carolina State Dental Societies, Richmond, Va., April 25, 1926.

quently seen after a hurried extraction has been performed, or when, after a root has broken, bit after bit is taken out of bone, gum and root, the apex not infrequently remaining. Because of the fact that the tissues of the mouth seem to be more or less immune to the bacteria commonly found in the mouth, one should not rest easy in the abuse of the tissues either soft or hard, as, by so doing, the lymph spaces are opened, the cancellous bone is exposed and there is grave danger of systemic infection. If one were to check up on patients who, within twenty-four hours after having their teeth scaled, developed fever and leukocytosis, more care would be exercised and less laceration of the gums produced. Such a study would tend to limit the number of teeth extracted at any one sitting and result in less tissue damage being done in every extraction.

The surgical principles involved require cleansing of the tooth in order that infection be not pushed into the tissues by the advancing forceps, which I believe should not be forced under the gum at all. This I know will be opposed by the specialist who extracts teeth under gas or ethylene. He is likely to be more interested in getting the teeth out than he is in the welfare of the patient, and if he knew how many of his patients subsequently developed a systemic infection, resulting in the lighting up on an old endocarditis or other serious lesion, he would be less energetic in his traumatic endeavors. The trend of these remarks so far, you will perceive, has been in depreciation of so-called surgical extraction. In view of the serious consequences that often follow the liberation of bacteria into the blood and lymph streams, there is no doubt of the danger that attends the elevation of the periosteum within a septic field, the cutting away of the cortical bone, opening up the canals of the cancellous bone (so-called because it is made up of canaliculi) and the smearing of saliva-laden bacteria over it. It is bad practice after the tooth is out to use the curet further to remove the mass of granulation tissue that is the only means of repair and is usually well surrounded by a protecting wall of fibrous tissue. Not only this, but a favorite talking point is the removal of the diseased wall of bone beyond the fibrous tissue. This lamina dura is a protecting wall between the infected tooth and the lymph and blood streams. If this is removed, there is no limit to which we can go with a curet. The surgeon has thrown his curets away, and the dentist should not begin to use them.

It is not infrequently necessary to remove movable gum tissue from the ridges, a condition brought about by the removal of the bone beneath in the effort to prepare the mouth surgically for a denture. In fact, so popular has the cutting process become that it has even been suggested that the plates be made first and the mouth cut down to fit them.

No doubt, tenderness and pain result in the ridges at times from the stripping of periosteum from the bone in a hurried extraction. We should have a wholesome respect for vital tissue both bony and soft, remembering that bruised and lacerated tissue is more prone to infection.

The preparation of a mouth for a

full denture should be confined to the relief of undercuts that will not be corrected by natural absorption.

Bony tumors in the palate and exostoses, not infrequently seen on the lingual aspect of the lower jaw, should be removed.

The buccal or labial process over one or two teeth which have been retained long after their neighbors have been lost, must at times be removed to facilitate the fitting of a denture. This can be more safely done two or three weeks after the extraction of the teeth.

Hypertrophic tuberosities may at times be advantageously removed.

The liberation of fibrous bands from the alveolar ridge is frequently necessary, but of more importance is the restoration of the sulci. This can be best accomplished by means of the Esser inlay, as the cutting of fibrous bands and stretching of the tissues is usually unsatisfactory.

At times the labial frenum has a low attachment and should be simply cut and sutured.

As I see it, the surgical preparation of a mouth for a denture is of far greater value to the prosthetist than it is to the patient, who many times is in worse condition than he was before.

Should the patient's health (and comfort) be jeopardized in order that his alveolar ridges may be a little more symmetrical and that he may have the distinction of having had a "surgical operation?"

THE SURGICAL ELIMINATION OF GRANULOMATOUS AREAS*

By JOHN EGBERT NYMAN, D.D.S., Chicago, Illinois

IF apical infection with granuloma cannot be eradicated by apical resection, extraction must be performed; but whatever surgical measures are employed should be thorough and carried out with surgical precautions. A simple extraction removes part of the infection, leaving a less serious open infection in place of a dangerous closed focal infection.

But natural repair processes must eliminate the residual granuloma or its fragments before physiologic repair can begin and be continued to completion. This infected neoplastic tissue must be broken down and sloughed out before real repair can occur.

In but rare instances does an apical granuloma come away even approximately entire with the extraction of a tooth or root. Granted for the sake of argument that, in the majority of cases, natural processes do disintegrate and throw off infected apical granulomas, the percentage of cases in which they fail to do this is too large to justify a simple extraction, the operator complacently leaving it to Nature to do the rest. It is this type of operation coupled with the aforesaid failure on the part of natural processes that has led many medical practitioners to a reactionary belief concerning dental focal infections as a definite and serious cause of systemic disease and furnishes the grounds for the emphatically expressed negations of the reactionaries of the dental profession.

Reactionaries, both medical and dental, assume that because systemic derangements persist after the extraction of teeth diagnosed as having apical infection *per se*, it has been demonstrated that apical dental infection is of comparatively little importance in the etiology of systemic disease. Over and over again have we heard the argument, "He had a lot of teeth extracted, was better for a little while but then grew worse again, and now he's as bad as ever."

But the important and pertinent query in regard to this apparent proof is: Was anything more than mere extraction done? If nothing further was done, then the following occurred: All or a large part of the infected granuloma remained adherent to the jaw bone. For a while, there was drainage through the socket, and the patient temporarily improved. Then, the soft tissues of the gums and mucous membrane, which proliferate rapidly, closed the orifice of the socket and in a short time a closed focal infection was reestablished and the patient relapsed into his former systemic condition. An incomplete local operation failed to

*Read before the Midwinter Clinic of the Chicago Dental Society, Jan. 28, 1926.

accomplish permanent systemic improvement or cure because residual infection was left and redistributed systemic infection.

What a weak premise on which to base a belief and formulate a principle of practice!

Those of us who are in constant cooperation with medical and surgical practitioners know that there is overabundant clinical proof of the beneficent and curative effect of the complete eradication of apical infection. Anyone who has ever been in professional contact with a case of neuroretinitis, with its relentless progress toward blindness despite all that a highly skilled oculist of vast experience could do, and has seen that march toward darkness stopped and vision restored by the discovery and eradication of an osteomyelitic condition in the jaw from which teeth with apical infected granulomas had been merely extracted many months before, and the soft tissues had completely healed over and hidden the persistent residual infection, will never again perform an incomplete operation. I have had such a case in the very recent past.

The following cases are also cited as proof of the necessity of complete operation.

REPORT OF CASES

CASE 1.—Mrs. M. P. B., referred because of a growth in the upper jaw where the upper left central incisor had been extracted. The socket had closed over. A simple extraction had been performed four months previously. The radiograms taken at that time, which the patient was able to obtain for my examination, showed definite evidence of granuloma at the end of the root. She reported that the socket had practically closed, when three months later, this growth began to appear where the tooth was extracted. At the time the patient came to me, she was having a temperature of 102, and pulse of 120, irregular and of the "pistol-shot" variety, together with symmetrical arthritic pains. She greatly feared the growth was malignant. After anesthesia, a section was removed by cautery and sent to a laboratory for an immediate histologic examination. The laboratory reported that it was simply granuloma tissue, with interstitial infection. Operation disclosed a granuloma extending back under the floor of the nose from the apex of the socket for a distance of approximately 10 mm. Thorough curettement and postoperative treatment was carried out until granulation was well established, with no other systemic treatment. The pulse and temperature returned to normal and arthritic pains disappeared. For a period of one year, the patient has been in normal health.

CASE 2.—F. W. T., a man, had had the upper left first molar extracted. He reported that the operator had said that the largest sac that he had ever seen had come away with the root. The patient was referred to me because of a mass protruding from this socket, which was extremely sensitive to pressure and which bled from time to time when contact was made on it. He reported that the operator, whom he had seen three days previously, informed him that the socket was healing a bit too fast and that he would make an application which would shrink it down. The operator left the city the next day on a vacation and the patient was referred to me by his physician. He had a temperature of 101.6 F., with constant pain in the socket, headache and inability to sleep.

Examination disclosed rapidly proliferating granuloma from a residum of the so-called sac. Curettement and postoperative treatment was carried out until normal granulation was established. The temperature returned to normal in twelve hours, and the pain in the socket and the headache disappeared, as well as the insomnia.

CASE 3.—Mrs. M. N. suffered for a period of about two years with a distressing eczema, with frequently recurring exacerbations of the acute herpes type. Classical treatment failing to give relief and the case was referred to me for examination as to possible jaw infection. The upper jaw was edentulous. In the lower jaw, there were but six incisors remaining, all of which were vital. The edentulous regions gave no striking in-

dications of osteomyelitis on macroscopic examination, but radiographic examination disclosed probable osteomyelitis in the upper right jaw and the lower left jaw. The patient gave a clinical history of removal of teeth in these regions "because of blind abscesses at the ends of the roots" some two years previously, and, in responding to questions, said that they had just been extracted, that her skin condition was better for a while but then grew just as bad again "so they knew it wasn't the teeth that caused it."

Operation disclosed a definite osteomyelitis with granulomas in both regions worse than the radiograms suggested. Curettement and postoperative treatment was carried out for ten days, and all systemic treatment was suspended save mild topical applications to eczematous areas. In approximately three weeks, the skin condition completely cleared, and there has been no recurrence for over a year.

CASE 4.—J. R. B. suffered from arthritis and general malaise. The molars and second bicuspids in the upper and lower right jaws had been extracted two months previously, with no curettement and no postoperative treatment. The condition improved for a time, and the sockets closed over in two weeks. A month later, the arthritic condition was as bad as ever.

Examination disclosed osteomyelitis. The infected granulomas were curetted out, and postoperative treatment was carried out until healthy granulations covered the area of operation. The arthritis and general malaise disappeared.

CASE 5.—Mrs. J. M. J., who suffered from acute arthritis of the right knee, arrhythmia and myocarditis, gave a history similar to that of the previous case. With the same operation, the arthritis and cardiac conditions were completely cured.

These are but a few cases, cited for their variety, of the many that I have had to deal with in the past year, and due solely to the fact that incomplete operations have been performed in cases of apical infection accompanied by definite granuloma.

Some able men are advising against the removal of granulomas by curettement at the time of extraction, and have stated that these granulomas are really the first stages of repair tissue and that the removal of them not only may cause a diffusion of the infection but also delays the healing process. It is true that their microscopic appearance is similar to that of tissue undergoing primary repair, but it is not normal primary repair tissue, but abnormal tissue which will continue to be abnormal and which may, instead of degenerating, begin to proliferate, as was the situation in the cases of Mrs. M. P. B. and F. W. T., just referred to, and I should like to point out that cancerous tissue is of the same microscopic appearance as primary repair tissue, and no one will even suggest that a cancerous mass is normal repair tissue. Granuloma tissue is not normal granulation repair tissue any more than epithelioma is normal epithelial tissue, endothelioma normal endothelial tissue or sarcoma normal connective tissue.

Able men have also advised against complete operation at the time of extraction because, unless performed under surgical precautions, there is danger of serious diffusion and aggravation of the local infection or operative trauma to important nerves, blood vessels and other tissues, in regions such as those of the inferior dental canal and of the maxillary sinus; and they are justified in this advice, but I wish they had felt equally impelled to advise that strict surgical precaution always be exercised in the extraction of teeth.

It is better, of course, to take the possible chance of Nature's eliminating the remaining pathogenic tissue than to attempt to remove it in a haphazard unscientific manner, which probably will aggravate and extend the diseased condition.

One has only to read the article by Dr. Potts,[1] giving a history of the clinical cases in the Cook County Hospital, with the postoperative pathologic results of unscientific surgical extractions, to be completely convinced of the necessity of surgical precautions in the removal of teeth and roots. Rubber gloves, iodin solutions and sterilizers are inexpensive and essential. Surgical methods conscientiously persisted in finally develop the "surgical habit" so necessary to obtaining desired beneficial results.

The technic which is rigidly followed in all cases in which a tooth must be removed with a definite apical granuloma is as follows:

TECHNIC

The patient is given one-half grain of codein by mouth twenty minutes before the operation. The patient's hair is covered with a sterile cap, the face is washed with tincture of green soap, followed by 60 per cent alcohol, and the body is covered with sterile sheet. Procain regional anesthesia, with an extemporaneous anesthetic solution, is administered within three minutes after the last boiling. An all glass syringe is used with iridioplatinum needles, which are not apt to break, and can be made absolutely sterile in the flame of an alcohol lamp. A combined tongue depressor and reflector is placed in operation in the mouth, with sterile cotton swabs along the buccal region above and below. The tooth to be removed and the adjacent teeth are thoroughly swabbed with compound solution of iodin U. S. P., followed with an application of the same solution under the free margin of the gum. Sterile rubber gloves are worn by the operator and sterile operating instruments used.

After extraction, the socket is irrigated with warm sterile physiologic sodium chlorid solution. The socket is flooded with Lugol's solution and a temporary packing is gently inserted to the bottom of the socket. This is allowed to remain for three minutes, at the end of which time compound solution of iodin is again applied to the socket. Without swabbing out this last application, the remaining granulomatous tissue is carefully and gently curetted from the socket, with suitable curets, the iodin solution is again applied and a thin packing of sterile gauze saturated with compound tincture of benzoin is placed in the orifice of the socket, care being taken not to permit it to extend down into the socket to a depth of more than 3 mm. Approximately two minutes after this pack is placed, the patient is dismissed, with instructions to return two days later for a postoperative treatment, consisting of the removal of the packing, gently, from the socket. The socket is then flooded with a 25 per cent solution of argyrol and a similar thin packing of the socket is again inserted, but merely in the orifice. This is repeated two days later, at which time packing is usually discontinued.

Even if the granuloma is found to invade the inferior dental canal, it can be removed by intelligent currettement without damage to either the inferior dental nerve or to the blood vessels. Dr. Earle E. Thomas has repeatedly stated that even cysts that have invaded the inferior dental canal can be removed by a skilful operator who thoroughly understands the anatomy of the region, without danger to the nerve and blood vessels of that canal. Of course, these curettements must be gently and intelligently done and with strict surgical precautions; otherwise, curettement should not be attempted at all. Curetting out granulomas does not involve curettement of the bone, and this should not be done.

In the upper jaw, the socket, after being washed out and flooded with compound solution of iodin, should be examined with a blunt explorer to ascertain whether the osseous floor of the maxillary sinus has been invaded, but precaution must be observed to avoid puncturing the floor and membrane of

1. Potts, H. A.: J.A.M.A., 77: 1885 (Dec. 10) 1921.

the antrum. But even in this region granulomas can be completely removed by curettement without forcing the infection into the antrum.

To my mind, to perform an incomplete operation and leave even fragments of the granuloma remaining in the socket is analogous to clipping off a tonsil and leaving a portion of it remaining in its bed.

These are the cases that are apt to develop a postoperative hemorrhage; in which the normal healing process is apt to be delayed, with unusual local distress to the patient and with danger of the reestablishment and even extension of the infectious area in the jaws, and of systemic distribution.

During a period of over ten years in which I have practiced what I have termed a complete operation, I have never yet had an extension of the infection. I have noted speedier healings of the socket, and I have never yet had to resort to postoperative surgical measures.

Again, let me emphasize what I believe to be the supreme necessity of operating for the extraction of a tooth under strict surgical precautions. No one who has ever watched the establishment and progress of a case of Ludwig's angina, with all its grewsomeness and danger and with its pitiful percentage of fatalities, will ever again operate without strict surgical precautions; and, from my own experience, observing the results in cases in which incomplete operations have been performed as compared with those in which complete operations have been done, I am convinced that granulomatous areas should be curetted with the technic which I have described and that complete operations should be performed which will insure definite eradication of focal infection and facilitate the permanent healing of the region in which operation is performed.

CONCLUSION

Do not permit teeth with evidence of definite apical infection with granuloma to remain in the mouth of a patient showing persistent systemic derangement, especially if no other source of infection can be demonstrated and apical resection cannot be performed with the probability of success. Treatment is usually futile, and radiographic evidence is not positive and is often misleading.

Any tooth can be replaced artificially so that, as to appearance and function, it is a complete restoration. But optic nerves, retinas, heart valves, kidneys and deformed joints cannot be replaced and, when definitely involved, but rarely restored to even a minimal adequate function.

AN EFFECTIVE PLAN OF PACKING FOR EXTRACTION UNDER NITROUS OXID-OXYGEN ANESTHESIA

By R. T. VILLARS, D.D.S., and FLOYD T. ROMBERGER, M.D.,
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LITERATURE referring to the extraction of teeth under gas anesthesia usually alludes to the necessity of packing off the throat. This is done for a two-fold purpose: (1) to prevent aspiration of broken particles of teeth, fillings or loose teeth themselves into the respiratory tract, and (2) to obviate any escape of the gases while the operator is working.

Observation in numerous centers and clinics reveals the fact that packing the throat, as described in the text, is often a haphazard or uncertain procedure. Any odd assortment of cotton or gauze is indiscriminately packed into the oral cavity, with seemingly little reference to the anatomic relations or to the physiology involved. The plan herewith disclosed has been developed and successfully used over a period of two years, in the extraction of nearly 6,000 teeth, and, in the giving of 1,500 dental anesthesias. It has been found uniformly successful, is ideal from the point of view of the anesthetist, enables the exodontist to work without hurry, and, when used as illustrated and explained, is without discomfort to the patient.

First, a study was made of the anatomic relation of the tongue, the palate and the posterior pharyngeal wall. For this purpose, the skull and wet sections were first employed; then, it was worked out clinically. It was found that packs, as ordinarily prepared by the manufacturers for this use, are often too large or too small to accomplish the purpose. It was discovered, further, that, in many instances, in an endeavor to shut off respiration completely through the mouth, the pack was introduced so far into the oral cavity that it came in contact with the posterior pharyngeal wall, there proving a source of irritation, likely to cause the patient to cough. Such packs do not adapt themselves so readily as might be supposed or expected to the various contours of the oral cavity. For these reasons, cotton of long fiber and the highest grade was found to be most satisfactory for packing the mouth. The quantity can be varied, added to or taken from, as may seem indicated by the various cases. Cotton of the cheaper or inferior grades has a short fiber, does not pack tightly and becomes fuzzy; and small particles tend to loosen themselves from the mass and get into the throat, thereby causing irritation and coughing. This difficulty is not encountered when a superior grade, long fibered cotton is used.

Figure 1 illustrates the first of the essential details. Here, we see a patient in the ordinary position for extraction, with mouth held open by a prop, and a

nasal inhaler laid upon the face. When the patient is in the chair in this position, it is well to keep up a certain amount of conversation, and, as the inhaler is placed over the nose, to say calmly, "Now all you need to do is breathe quietly and easily through the nose." You will observe that the nasal

Fig. 1.—Patient in the chair, with prop in place, ready for the nasal inhaler.

Fig. 2.—Nasal inhaler, laid easily on the face. After the first few inhalations of 100 per cent nitrous oxid, cotton is placed over the mouth.

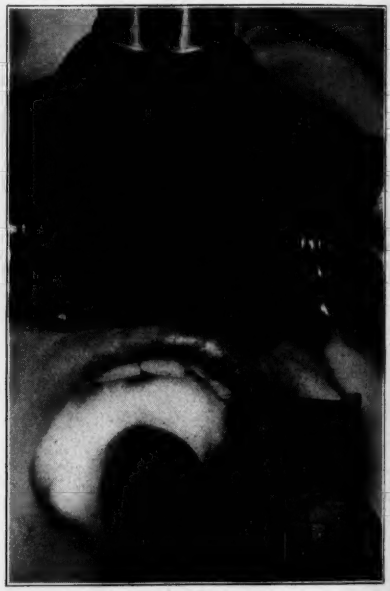

Fig. 3.—Nasal inhaler, strapped on tightly. The introducing finger pushes the cotton upward and inward, packing it tightly.

Fig. 4.—Ready for the extraction, showing ample exposure of teeth.

inhaler merely lies loosely on the face, the gas being fed with considerable pressure. This procedure never alarms the patient, and nothing more is done until four or five breaths of 100 per cent nitrous oxid has been taken. By that time, the patient's senses are more or less obtunded, though touch and hearing may still be present to a certain degree. You then say to the patient, "I will now hold a little cotton over the mouth," and you proceed to do so. After two or three additional breaths, the nasal harness is strapped on as shown in Figure 2. You now have complete control of the patient. With the mouth completely shut off and the nasal inhaler strapped on tightly, the anesthesia proceeds; and, it is no different in any respect from the anesthesia which obtains in major general surgery.

You are now ready to pack. Refer again to Figure 1, and you see the cavity formed by the palate. This is the space to fill. Let the tongue lie in its ordinary position, that is, do not push it back, but with the finger pushing upward and inward, as illustrated in Figure 3, pack the cotton tightly until the entire mouth is full, leaving only the teeth exposed. Pack upward and tightly.

The mechanics of this upward pressure is thus explained. When introducing the pack by pushing backward (inward) only, one is more apt to press the bolus of cotton against the posterior pharyngeal wall. When packed in an upward direction, the cotton first meets resistance in the vault of the palate, then follows the contour of the bony structures backward and downward until it presses down on the posterior part of the tongue. This downward pressure on the tongue tends to prevent the cotton from coming against the posterior pharyngeal wall. In fact, it is difficult to push the cotton against the pharynx by upward packing. The bolus, with continued upward pressure, merely tends to revolve.

The patient is ready for the extraction (Fig. 4). You will note that the pack completely fills, and indeed is quite tightly pressed into, the cavity of the palate, leaving the teeth exposed for the work of the exodontist.

You will be surprised to find that there is practically no leakage of gases around your pack and that you can use a considerably larger percentage of oxygen than is usual for extraction work. The patient sleeps more calmly; the operator can work more leisurely, more accurately, more confidently and without worry.

So successful has this method of packing proved to be that it has been found unnecessary to strap the patient in the chair before or during the extraction. Experience has shown that the anesthesia induced in this manner is so smooth that restraint is superfluous. Further, any excitement phase that patients are likely to have usually occurs as they are coming out of the anesthetic, rather than while going under; and the anesthetist and operator can easily restrain the most violent, under these circumstances, by each merely holding down one shoulder, should an attempt be made to arise.

To attain the optimal results in anesthesia and extraction, in difficult cases, the usefulness of the presence of an experienced anesthetist, in addition to the exodontist, cannot be overestimated. It is believed this method gives the patient the highest grade of service.

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Editorial

THE CONFERENCE WITH STATE SOCIETY OFFICERS

On January 25, 1927, there convened at Chicago a body of men who today hold in their keeping the welfare of organized dentistry in this country. An invitation was sent out by the President, Dr. Banzhaf, and the Secretary, Dr. King, to the officers of state societies to attend a conference at the central office of the American Dental Association for the purpose of considering problems of mutual interest to the Association and all of its component organizations. As a result, there were representatives from twenty-six states, together with several of the Trustees of the parent body, and three delegates from the American Dental Trade Association, making a total of seventy-four in attendance.

It is conservative to assert that never before has there been a meeting of greater interest or significance than this. Beginning at nine o'clock in the morning, there was never an idle moment till adjournment, after 10 p. m. At noon, a luncheon was served, and in the evening, a banquet—both tendered by the Association; but these short interruptions only served to relax the

men momentarily, and divert them temporarily, from the main purpose of the meeting, which was to consider seriously those factors which tend to bring about a better understanding and a greater cooperation between all of the organizations which go to make up the great American Dental Association.

The impelling motive of the officers in calling this conference was to bring before the state representatives some of the problems of the central office, and to seek counsel as to improvement in conducting the machinery of the organization. An earnest effort was made to get suggestions from all those present which would be helpful in bettering the service we are giving the Association and the profession at large; and, as a result, we feel that the staff at the central office has a better grasp of their duties and a more intelligent conception of the needs of the component bodies, and that the state officers have a more generous and sympathetic realization of the many intricate tasks with which the staff is constantly confronted. The only way to get wholehearted cooperation in any organization is through the medium of perfect understanding on the part of the various units which go to make up the organization, and the sole medium through which this understanding may be brought about is frequent conference where the different points of view are frankly and fully presented and discussed.

So much impressed with the great value of this conference were those present that unanimous action was taken to hold such a meeting annually, with the added suggestion that the Trustees of the American Dental Association be requested to attend.

In unison with the spirit of the meeting, a repetition is here made of the invitation extended in our February, 1926, issue for our members everywhere to visit the central office whenever convenient, and give us the benefit of their suggestions.

Heretofore, there has been an unintentional and unaccountable aloofness on the part of many of our members in their attitude toward the central office—an apparent assumption that it was something apart from their interests, and that in some occult way it had to do with an enterprise in which they had no

part. The exact reverse is true. The central office was organized and is conducted for the sole purpose of serving the members of the Association, and not those only who are prominent and well known, but serving the rank and file—even the very humblest and most diffident of our entire membership.

It is the ambition of the officers to make of the American Dental Association one of the most efficient and outstanding of all our professional or national organizations, and this can be achieved only by the most wholehearted and cordial cooperation on the part of every unit in the entire body. We firmly believe that the recent conference was a great step toward that end, and, on behalf of the officers, we hereby extend the heartiest thanks of the parent body to all of those who so loyally sacrificed their time and effort to attend.

CRITICS

It is probably true that we must have critics. Possibly the writers and painters would run wild without some influence to hold them in check. But let it be known that critics are not so important as creators, and the man who writes a poem or paints a landscape means more in the scheme of life than the man who proceeds to tear the poem or painting to pieces. Critics are seldom constructive. If they merely confined themselves to the function of suggesting better ways of doing things, we could open our hearts to them with a cheerier mien, but usually their chief aim seems to be to find fault. It is an unfortunate thing to become a critic because of the resultant attitude of mind. With the average critic, nothing is as it should be, even though most things are better than the critic could make them himself.

Unconsciously, the critic assumes an air of superiority which renders him oblivious to the opinions of others and makes him a rather disagreeable individual to encounter. He is so perfectly certain of himself that he brooks no interference with his ideas, and it is unsafe to question his judgment. His assumption of

infallibility occasionally leads him into positions which would embarrass the ordinary individual, but the critic is impervious to the chastening influence of being proved mistaken. Such a thing as humility is alien to his nature—it was winnowed from his soul when he became a critic.

It is recorded that a painting was on exhibition on one occasion, and a critic was declaiming against it. "There isn't a natural thing about it," he said. "See the attempt to put a fly on this corner of the picture—just a blotch—not a bit like a natural fly." At that moment the fly, probably tired of so much invective, flew away. History gives no indication of the effect on the critic, but it is safe to assume that he was unabashed. Of such stuff is the critic made.

If the people chance to like what the critic condemns, the critic pities the people.

Take the masterpieces of our literature—there is scarce one that would have passed muster with the critic. Turn the average critic loose on the immortal Shakespeare and there would be nothing left. He would smooth everything out till all the individuality and virility were gone—till there was no soul remaining. Fortunate that Shakespeare wrote before the ultra-modern critic was born. Fortunate that the authors of our masterpieces were oblivious to the blighting influence of the critic. The moment a man writes or paints to please the critic, that moment the very life is taken from his work—it is struck with dry rot.

Through all the ages, the critic has never inspired one noble impulse in a writer or painter, but he has stifled many a worthy and promising ambition. Possibly, he has done a kindness in checking some ostensible geniuses who really had no genius—we must be just and give him credit for that. Yet the sum total of the good he has done is dwarfed by the evil he has wrought. Anyone can kill a sentiment—few can create one. And in these days of material things, we need all the sentiment that can be created.

Blessed be the man or woman who flies in the face of the critic and says the honest straightforward thing regardless of pos-

sible censure. It is the individual who has been unafraid of the critic who has written the greatest literature and painted the greatest pictures.

Of course there are critics—and critics. The kindly critic who not only points out a fault but suggests a better way, and does it not with superciliousness but with encouragement is a balm from heaven. Such a critic does not hinder—he helps. No man ever died of too much encouragement, and no kindness ever killed. The one quality which the critic needs, and the one he most usually lacks, is charity. His inborn impatience with mistakes blurs his perspective and he becomes intolerant. It is not a crime to make a mistake—the crime lies in not pointing out a better way, if you know one.

After all, the greatest function of life is to be helpful, and almost the worst sin is to obstruct. Whatever encourages the faltering and the diffident and brings out the best there is in the individual is constructive and worthy. Whatever kills honest effort is disintegrating. Let the critic think more of developing the talent there is in people and less of the most effective means of picking flaws, and we will accept him—gratefully. If he goes far enough in this laudable process, we will even take him to our hearts; but so long as he delights only in ruthlessly exposing the frailties of his fellowman, we want none of him.

PROFESSIONAL DUTY

A man is largely what he makes himself—a profession is what its members make it. Every member of a profession has a duty aside from that which pertains to his family and his community. He is a professional man by virtue of the heritage handed down by others; through countless hours of toil, of investigation and of unselfish devotion to duty. His predecessors have laboriously accumulated the knowledge on which he feeds today, and feeds as freely as on the air of heaven.

He is not a real professional man unless he in turn contributes his share to the general acquisition of knowledge. To do

this he need not be a genius—a genius is rare and not always dependable. The common plodder in the field, if he persists in plodding, may be more useful to his profession and to the world than the most brilliant genius who depends solely on his brilliancy. Application is, after all, the great essential, and we may all apply ourselves. That is the most blessed privilege we have—as it is also our most urgent duty.

LLEWELLYN GARNET NOEL

(1852-1927)

Dr. Llewellyn Garnet Noel, past president of the American Dental Association, and well known dental surgeon of the South, died, January 20, at his home in Nashville, Tenn., at the age of 75, after a brief illness with pneumonia.

Dr. Noel was born in Logan County, Kentucky. He was educated in the county schools and laid the foundation for his professional education by studying in the office of his brother-in-law, Dr. W. H. Morgan. He studied medicine for a time in the University of Nashville, and completed his dental studies in the Philadelphia Dental College. While in the office of Dr. Morgan, Dr. Noel wrote the letter which called together the first convention in Tennessee of dentists in order to form a dental research society. After completing his college course, he established offices in Nashville and Louisville, but he later concentrated his work in Nashville, where he practiced in the same offices for fifty-one years.

Dr. Noel was president of the American Dental Association, 1902-1903, and at the same time he held the office of president of the Southern Dental Association. Later, he served as president of the state association and the Davidson County Dental Association. He held the degree of F.A.C.D., and was a member of the Psi Omega dental fraternity.

When the dental department of the University of Tennessee, which he was largely instrumental in founding, was merged with Vanderbilt University Dental School, in 1905, Dr. Noel was made professor of pathology, and he continued to hold this position until the suspension of the college a few months ago.

Dr. Noel contributed often to dental literature and he did much to advance his profession. Probably, the most significant work of his career was the founding of the dental relief, a fund for the care of the aged and infirm members of his profession.

Six children survive, three sons and three daughters, among the former, Dr. Leslie Noel of Nashville. His second wife, whom he married in 1902, also survives.

DEPARTMENT OF DENTAL HEALTH EDUCATION

HISTORY OF MOUTH HYGIENE IN CLEVELAND*

By HARRIS R. C. WILSON, D.D.S., Cleveland, Ohio

IN presenting the history of the mouth hygiene movement in Cleveland, I do so with the full knowledge that the recording of facts usually makes rather uninteresting reading. I shall try to interject some comment bringing out some of the developing ideas and ideals of the past thirty years.

The earliest work in Cleveland known to me was the work of the Oral Hygiene Committee of the Cleveland Dental Society (George H. Wilson, Weston A. Price and W. G. Ebersole) in 1897, almost three decades ago. This committee held a conference with Mr. Lewis H. Jones (superintendent of schools, Cleveland, 1894-1902). The result of this committee's work was the preparation of a card of instructions regarding "the nature, function and use of the teeth." This information was given to the pupils through the teachers. Spasmodic efforts were made by the Oral Hygiene Committee of the Cleveland Dental Society from this time on; but little was accomplished until the spring of 1906, when H. L. Ambler had a conference with the director of charities, H. R. Cooley, relative to the establishing of a "dental clinic for the indigent poor of Cleveland." This led to Dr. Cooley's discussing the matter with George H. Wilson and others. It was agreed that the work should be undertaken and that the city would pay a part of the expense.

April 2, 1906, Dr. Wilson presented to the Cleveland Dental Society the substance of the conferences just referred to, with the result that the president of the Cleveland Dental Society, D. H. Ziegler, appointed a committee of five to develop the idea and report to the society. The committee consisted by George H. Wilson, W. T. Jackman, W. G. Ebersole, H. L. Ambler and J. R. Owens (all now deceased except Dr. Owens). May 7, 1906, the committee reported a further conference with the director of charities, Dr. Cooley, and other city officials, to the effect that the city would provide and properly equip a room for a dental office and assign an assistant to aid the dentist in this work. The committee recommended to the society that it furnish the service of a dentist for as many afternoons as necessary for one

*Read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

year. The report of the committee was favorably received by the society, and a committee of fifteen was appointed to have charge of the "charitable work" to be done in the name of the Cleveland Dental Society.

Frank Acker volunteered to give one-half day each week as clinician at the new clinic established at the city hospital. The society raised money through voluntary subscriptions to pay Dr. Acker for a second half day each week. The children in the public schools in the neighborhood of the city hospital were referred to the clinic by the principals and teachers. This clinic was carried on for eighteen months, being discontinued late in July of 1908. The reason for closing the clinic was that the dental society did not feel able longer to maintain an operator, and the City of Cleveland was unable to appropriate funds for this work.

As a result of this work, the director of charities appointed, in October, 1908, H. E. Moffett as dentist at the Cleveland Boys Home at Hudson, Ohio, and he began work at the Home, Dec. 31, 1908, spending one day each week in caring for the teeth of the boys in that institution. The City of Cleveland furnished the outfit at Hudson and all materials, and paid the operator's salary. This work was carried on for about a year, and, after a lapse of two years, owing to a change in administration, the work was resumed, in 1911. It has been carried on spasmodically to the present date.

Dec. 1, 1907, C. H. Clark, superintendent of the state hospital for the insane, at Cleveland, appointed E. M. Herrick as resident dentist. Dr. Herrick filled this position for a year and a half, and, for the remaining time, has given two mornings each week to the care of patients in this institution.

In the spring of 1909, the Oral Hygiene Committee of the Cleveland Dental Society, W. G. Ebersole, chairman, J. R. Owens and Weston A. Price, obtained permission from the board of education to examine the teeth of the children in four of the public schools. This examination showed that 97 per cent had defective mouths. Following this work, the oral hygiene committees of the National Mouth Hygiene Association, Ohio State and Cleveland Dental Societies, worked in unison in an effort to gain permission to establish dental inspection of all school children and to have dental clinics established in the school buildings for the care of necessitous children.

The board of education, Nov. 1, 1909, granted Dr. Ebersole and his associates permission to undertake this work. The following month, December, 1909, Dr. Ebersole presented his problem to the dental manufacturers club, with the result that they made a contribution to carry on the experimental work he had outlined. Six firms loaned equipment for six clinics.

Clinics were established at Stanard, Sackett, Lawn and Marion schools and St. Alexis Hospital, and at Carnegie West Branch Library when that building was completed.

March 18, 1910, the oral hygiene campaign was opened in Gray's Armory. That morning, the above mentioned clinics were formally opened. The operators either gave their services or were paid from personal contribu-

tions made by members of the Cleveland Dental Society.

At this time, Dr. Ebersole undertook the work since known as the "Marion School Experimental Class." The money to carry on this experimental work was furnished by the dental manufacturers club. A full report of this work was published in a pamphlet entitled "The Marion School Report." In the spring of 1910, the children (20,890) of thirty-one schools were examined by members of the Cleveland Dental Society. I was in charge of the work, and Dr. Acker acted as superintendent of clinics, carrying on this department of the work until May 17, 1911, during which period 2,217 operations were performed on 372 children.

E. L. Pettibone at this time had charge of delivering forty-nine lectures in school auditoriums.

In the summer of 1911, the National Mouth Hygiene Association was formed in the City of Cleveland. The mouth hygiene work, at this time, came under the control of the national association and, in 1912, the Cleveland auxiliary of the National Mouth Hygiene Association was formed. This association was composed of the dentists and a few laymen who had been most active in the work of the previous year or so. In October, 1912, there being no further funds to carry on the work in the hands of the mouth hygiene association, a number of dentists on the West Side organized for the purpose of conducting a clinic at Carnegie West Branch Library, using the equipment that had been loaned to the National Mouth Hygiene Association. This clinic was operated two half days a week for eighteen months, October, 1912, to April 1, 1914.

In March, 1914, a campaign was conducted by the National Mouth Hygiene Association to raise money for the Cleveland Auxiliary, to be used in establishing and maintaining school "dental clinics" and in educating the children and the citizens of the community to the value and need of mouth hygiene. The chamber of commerce of the City of Cleveland refused to allow the conduct of a campaign for more than $75,000. We were successful in raising $30,000, a large part of which was collected.

Within two months after the campaign, five dental clinics were reopened, four in the public schools and one at Carnegie West Branch Library. Owing to the fact that one of the equipments originally used had been transferred to Birmingham, Ala., and one was in use at the boys' school in this city; and one equipment—that of Lee S. Smith & Sons—had been recalled and was in the possession of the donor, it was necessary that the Cleveland auxiliary purchase new equipments. These clinics have been operated continuously, with the exception of the periods of school vacation, since May, 1914.

After the 1914 campaign, Dr. Ebersole was much exhausted from the severe strain of all his activities. It became necessary for him to be relieved of part of his duties. He chose to relinquish the active control of the work in Cleveland, and, in March, 1915, I was made secretary-treasurer of the Cleveland auxiliary of the National Mouth Hygiene Association. In Sep-

tember of that year, a new dispensary was established, at Murray Hill School, an institution of considerable social fame, in the heart of an Italian district, with an attendance fully 98 per cent Italian.

Three months later, in December, 1915, the Cleveland Mouth Hygiene Association turned over to the Cleveland Board of Education complete control of the five units in public school buildings. The board began operating these clinics, Jan. 3, 1916, three half days a week each. The Mouth Hygiene Association has never since had any responsibility for the work in the public schools. The work has been greatly expanded and has been carried on in a manner generally acceptable to the school administration and the public.

With the accomplishment of one of the avowed purposes of our campaign of 1914, namely, the establishment of dental clinics and mouth hygiene instruction and mouth inspection in the schools, the mouth hygiene association turned its attention to industrial clinics and clinics for necessitous adults. I had not at that time differentiated between a dental clinic and a mouth hygiene clinic; therefore, there was nothing incongruous in turning our attention to the development of the industrial dental clinic. We had the privilege of completely developing an industrial clinic at the Kaynee Blouse Company, a factory employing several hundred men and women, chiefly women, in making clothing for young children. There was no idea of philanthropy in this institution. It was purely an economic measure, the desire being to limit as much as possible the amount of time employes were off duty. Mr. Louis H. Hayes, the active manager, believed in bringing every possible service to his employes in the plant rather than having the employes go outside for needed service; solely for the reason that the employes would be on duty more hours and the machine-like production of the plant would be less interrupted. Service, which was purely restorative and curative, was developed on a cost basis. We made dentures, bridges, crowns and fillings. Patients were encouraged to clean the teeth, and prophylactic treatments were given at cost. Mechanical work was sent out to a laboratory, as is common practice with dentists today. The money loss during the first year of this clinic was approximately $400. The amount of time saved for the plant was of far greater value than the $400. Therefore, the management was agreeable to carrying on this work and did so for several years.

I soon began to realize that the industrial dental clinic was not the thing in which I was most interested, and in my mind there developed the difference between hygiene and the practice of the medical arts. Hygiene is "that branch of medical science which has to do with the maintenance and improvement of health." With the idea of "hygiene" developing in my mind, we turned our attention to the care of children attending schools other than the public schools.

In 1917, with a clearer understanding of our function, we began to develop a service for parochial school children similar to the service in the public schools. The health center idea seemed to be the means of entering this field; therefore a new mouth hygi-

ene unit was developed at Health Center No. 2 in the heart of the down-town slum district of Cleveland.

The idea of federating social agencies was at this time developing definitely in the minds of social workers throughout the country. The war, with its campaigns for raising money and selling bonds, taught us how to conduct big public campaigns for public purposes. In Cleveland, there had been developed, in January, 1913, the Federation for Charity and Philanthropy, which, in 1916, became the Welfare Federation of Cleveland. The mouth hygiene association, in 1916, was accepted as a member agency of the Federation for Charity and Philanthropy, and has since that date maintained its existence along with a hundred or more agencies in the social field.

1917-1918 saw the development of two more health center units. One unit was later developed, with three chairs operated practically full time.

At this time, there developed on the part of the public schools and the health centers a considerable need for a dental surgical service of a type nowhere in existence in Cleveland. In 1917, plans were consummated for dental surgical service at the city hospital. This service has been constantly developed and increased to a point where, each month, we handle more than 800 cases under anesthesia. Beginning in September (1926), the capacity will be approximately 1,000 cases per month. Cleveland owes Dr. Herman C. Kenyon and his able staff a debt of gratitude for this splendid service.

In December, 1923, two of the chairs that had been in the health center with three units were relocated in parochial schools, and the city health commissioner assumed the financial responsibility, providing for supplies and for a full-time dentist in each of the two schools, for the care of elementary school children. Thus, the mouth hygiene Association again began shifting the responsibility of the privately supported mouth hygiene dispensaries to the tax supported city health department.

In March, 1925, the City Health Department assumed, in addition, the financial responsibility for three dentists full time in the city health centers. Thus, the mouth hygiene association was further relieved, but with the condition that the mouth hygiene association provide the five full-time dental assistants and the supervision of the five units. At this time, the service in the health centers was designated as limited to service for children of elementary school age. While it has not been possible to eradicate completely service for adult patients, the effort has been to make all of these dispensaries serve the children from the standpoint of hygiene.

During this development for the parochial school children in connection with the city health department, a preschool age mouth hygiene clinic was developed at the babies dispensary and hospital for the care of children under school age (October, 1920).

The program of the board of education has been advanced during the last ten years about as follows: From 1916 to 1920, the five chairs were operated by the board with increasing amount of time. During the school year of 1920-1921, two chairs were added. At this time, the seven chairs were operated full time, or ten half days a week each. During the next two years, no apparent advance occurred. During the school year of 1923-1924, two chairs were added for the use of dental hygienists, this being Cleveland's

first use of the services of the dental hygienist in public schools. In the year 1924-1925, thirteen chairs were added. In the year 1925-1926, eight chairs were added, making a total of thirty chairs operating full time. At the present moment, four additional chairs are being made ready for use this fall. The board of education has for three years maintained, in addition to the chair service, an examination service which covers all children in elementary public schools, just less than 100,000. This September, the board of education will employ nineteen full-time dentists, seventeen full-time dental hygienists, twenty full-time dental assistants and one stenographer-secretary.

The city health department will employ five dentists full-time; and the mouth hygiene association will employ five dental assistants full time and a secretary-stenographer.

The mouth hygiene association has unofficial but practical supervision of the babies dispensary and hospital service for preschool age children, and advisory direction of a unit at the children's fresh air camp.

It will thus be seen that there will be sixty-eight persons devoting their full time to the mouth hygiene work in the public and parochial schools of Cleveland. I am devoting my entire time to this service. In addition, there are a number of pieces of work carried on in various institutions as the result of the activities of the mouth hygiene association and its predecessors, who were active in Cleveland during the past almost thirty years.

It may be interesting to realize that the work in Cleveland is about 90 per cent supported by taxes. The remaining 10 per cent is still provided through the welfare federation. In Cleveland, it is felt that this work should be carried on entirely by tax-supported agencies, and, in the not distant future, we are confident that such will be the case.

There have been crises in the development of mouth hygiene in Cleveland when it seemed almost impossible to carry on the work; but each time it has been bridged over until now we feel that the work is fairly well established and will probably continue. Of course, our policies change from time to time. Our effort is at present centered on the 6-year-old child. Our thoughts are on the child of preschool age. The board of education, this summer, granted us a budget of about $1,900 to carry on a preschool summer clinic, in which we handled 324 children. Complete physical examination was made of each child. Teeth, tonsils, eyes, ears, heart, lungs, etc., were all carefully examined, and where defects existed, an effort was made to have corrections completed before the opening of school next September, as a considerable portion of the group in this clinic will enter school next September as kindergarten or first-grade children.

In Cleveland, we have largely abandoned the term "dental clinic." It is "mouth hygiene," and we are trying to get all concerned to speak of the room where our work is carried on as the hygiene room rather than as the dispensary room or clinic room.

One of the serious problems confronting us is to secure properly trained people for our staff. The present members of the staff are doing their best with the training that they received in school. Most of us feel that there should be changes made in school training to equip the personnel for mouth hygiene in public schools.

THE DENTAL TREATMENT OF CHILDREN*

By ERNST HADERUP, Copenhagen, Denmark

As reporter for the subcommittee of the Hygiene Commission of the F. D. I. concerning dental treatment in schools, I, this spring asked the members of the subcommitee for their opinion as to the best manner in which the dental treatment of children could be affected. As a basis, I referred to a lecture by Professor Kantorowicz (Bonn), "The Dental Treatment in the Schools" (which has since been printed in the F. D. I. bulletin), and I especially asked for their opinion as to whether the subcommittee should extend its territory to cover the proper nourishment of pregnant women and infants, and through this work, create the best conditions for strong and healthy teeth for the next generation.

Since the study of the value of proper nourishment has been developed to such an extent that no one would now doubt that an improper diet is highly injurious to the teeth, I believe that the subcommittee ought to take up this work.

It has, therefore, been very interesting to note from the different statements received from the following members of the subcommittee: E. Benoist (Pau), John Brun (Oslo), H. J. Burkhart (Rochester, N. Y.), Konrad Cohn (Berlin), H. DeW. Cross (Boston), L. Haloua (Paris), Albin Lenhardtson (Stocksund, Sweden) and M. L. Rhein (New York), that they all agree to the great importance of early prophylactic care and proper nourishment, and that this is particularly appreciated in the United States where prophylactic measures, mouth hygiene (cleansing and polishing) and education are considered of more importance than later treatment in the schools, which previously has been the main consideration in treatment of children's teeth in European countries.

Almost all of my colleagues mentioned state that the present unfortunate economical conditions in states and communes are a hindrance to successful accomplishment in the treatment of children's teeth; that is, care from the prenatal period to adolescence.

In several of the statements stress is laid on the early filling of fissures and pits, particularly in the first permanent molars. In this connection, I may call attention to the fact that Professor Bödecker, of New York has suggested that fissures and pits in these teeth always be filled, even in cases where they are not yet decayed, because more than 98 per cent of these teeth are bound to decay. One good reason for early filling is that the pulp is preserved. Dr. Cross declares that if the children at the age of 16 years have not vital pulps in all teeth and only a few small fillings, the treatment has been a failure.

Dr. Cohn says that the physicians are mainly responsible for early prophylactic measures. The task of the subcommittee is therefore mostly to stimulate interest, and first of all to gather all the available literature re-

*Read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 24, 1926.

garding the influence of a proper and an improper diet.

For prophylactic treatment, hygiene and education, the majority prefer the dental hygienist rather than the licensed dentist, provided she has received a good and thorough training. Furthermore, she is responsible for regular examination and early filling of fissures and pits. Dr. Rhein also lays stress on the psychologic importance of her influence, as she, according to his experience, eliminates the child's fear of dental treatment.

Besides the education of parents and children and, to a certain degree, of teachers, it has been suggested—and no doubt rightfully—that the practicing dentist needs an energetic course of enlightenment. It is considered important that mothers be informed as to the condition of children's teeth, and that they be given instructions in the use of the toothbrush. Parents' meetings and public agitation, with the assistance of the cinematograph, are also valuable. Dr. Bruhn mentions the importance of breast feeding, and for older children, proper mastication, especially the eating of a dry food such as crushed unscaled cereal. Regular inspection and examination, first when the child enters school, and thereafter once or twice a year, is recommended, and a card system showing the condition should be kept. With regard to the actual treatment, there is a difference between American and European opinions. The former lays greater stress on the prophylactic (including the preventive small fillings), hygienic and educational measures, control and examination, more than on the treatment itself, which should be mainly a private matter, except for the very poor, who have to be treated at the dispensaries, when the teeth have been given a good start, with supervision, up to the thirteenth or, at the latest, the sixteenth year.

To give definite suggestions on the basis of these different opinions is hardly possible. From a social point of view, it seems natural to choose the American standpoint, if the treatment is to be started right from the beginning. Perhaps in Europe we are too much inclined to depend on free treatment, even those who are very well able to pay for it. We find this, for instance, in the highly developed system of organizations for insurance against illness in my country (Denmark), an insurance system in which the well pay for the care of the sick. The latter pay a small fee themselves and the state contributes 25 per cent of the organizations' total expenses. The state, therefore, has a great deal of influence on the administration of these organizations and has fixed certain maximum incomes for people who wish to become members; but it has not been possible to make the public observe these limits more than to a certain degree. Furthermore, children of wealthy parents are admitted as members as soon as they obtain a position with a small salary, and this is especially the case among the farmers. The result of all this is that more than three-fourths of the adult Danish population are members of such government-supported institutions, although in many cases their economical condition does not warrant this. The reason why I dwell on this subject is that several other countries are contemplating the adoption of the treatment of the teeth by such organizations as a continuation of the treatment in the schools, a system which has been adopted in a wide degree in Denmark.

I cannot characterize this arrangement as a satisfactory one for any of the parties concerned.

For states and communes contemplating the adoption of dental treatment in some form or other, it is best to spend the means at their disposal in such a way that it most probably will bring a direct result, and not to scatter the efforts over too wide a field and consequently waste them on an unsolvable problem.

Where a system for dental treatment has already been adopted, the results already attained should of course not be destroyed, but an effort should be made to start the dental treatment from the bottom, that is, with the care of pregnant women and infants, before starting it for those of more advanced age. Of course, it is evident that the dental treatment of children of school age, where only this system has been adopted, is of great benefit to humanity, better for the present generation and the next; better for mankind in general.

Great difficulties will be incurred in starting the dental treatment from the bottom. Cooperation with the physician and an extensive educational work will be necessary. It would be advisable for the subcommittee to take up the question of the best methods for further discussion.

In the meantime, we will, with interest, and a certain amount of impatience, await the results of the work of the F. D. I. scientific commission and institute of mouth hygiene. Dr. Benoist, in his statement to the subcommittee regarding dental treatment in the schools, points out that the entire dental profession should assist the F. D. I. in its work for humanity.

DENTAL CONDITIONS IN GREAT BRITAIN*

By WILLIAM HOLDEN SHIPWAY,† L.D.S., R.C.S., Bristol, England

IT would appear that industrial dental clinics are more widespread in America than in Great Britain. This may be on account of the greater population and the fact that, in the United States, there appears, to me at any rate, to be no organized system of supplying dental treatment to the poorer members of the population such as there is in Great Britain, where such treatment is more or less exactly organized in three ways: (1) the school dental service; (2) national health insurance dental work; (3) industrial dental clinics.

THE SCHOOL DENTAL SERVICE

The school dental service is organized and controlled by the governing authorities of our cities and counties. It is maintained by a levy partly from local taxation and partly from state taxation. The dental surgeons employed are generally full-time officers who work in (a) clinics, one or more in number, centrally situated in the case of large cities; (b) traveling clinics, in the case of small towns, counties of sparse population and villages. All these clinics are equipped and maintained by the same source as supplies the dentist's

†Dental surgeon to A. S. Fry Sons, Ltd., Chocolate Manufacturers.

*Read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 23, 1927.

salary; namely, the state. This could be termed "state dentistry." It differs from what is, I believe, known as state dentistry in the United States, since the work is largely reparative and not merely of an educational nature, that is, a service in which the parents of the children needing treatment are merely referred to a private dentist.

These school dentists aim to deal with children from 7 to 14 years of age, but in districts that are not fully staffed, only those from 6 to 8 years are dealt with. This age limit of 14 years may probably be extended to 16 years ultimately, as the school-leaving age is raised in our public schools.

NATIONAL HEALTH INSURANCE DENTISTRY

Under our insurance act, all employed workers earning approximately $1,250 or less are compelled to take out insurance against sickness and old age by the payment of approximately 36 cents a week to national health insurance funds. These funds are repaid to the insurance company, or friendly society or sick club to which the worker belongs, and are used to pay (a) the physician's fees and the cost of medicine; (b) sick pay in money while ill; (c) maternity benefit; (d) pension to widow if worker dies, with allowance for children; (e) old age pension, at 65 years.

The surplus funds left, which are considerable, are used to pay for dental treatment of the insured workers and, in some cases, optical treatment. He is treated by any dental surgeon, or any dentist in private practice who is willing to undertake this class of work. A scale of fees has been worked out by a joint committee of representatives from our dentistry of health, the dental societies, and the friendly societies, or sick clubs for this work, and about 9,000 dentists out of 12,000 dentists in Great Britain have agreed to do this "panel dentistry," as it is popularly called. This insurance dentistry takes only insured workers over 21 years of age, and does not include their wives or children.

INDUSTRIAL DENTISTRY

Industrial dentistry generally deals only with conservative treatment; i. e., fillings, scalings, extractions for (a) employes under 21 years, (b) emergency treatment for all employes.

It is, for the most part, free, the whole cost being borne by the employer, including the equipment and maintenance of the dental surgery at their works.

It deals with young people at a very important age, when a little filling of decayed teeth will arrest the spread of caries in later life and postpone the age at which they will begin to require artificial dentures. It supplies the link between school dentistry and national insurance dentistry. Many of our larger industrial organizations have recently equipped such clinics. Our oldest industrial clinics date back for twenty years or more.

FUTURE TENDENCIES

In the future, we expect to see a reduction of the age limit at which the insured worker becomes eligible for national health insurance dental treatment, and industrial clinics have been of late adapted to deal with the dependents of their employes as well as the employe himself. The surgeries connected with such works have been loaned for such work after working hours.

There is also a movement for individual industries or employers, provided they are large enough to form their own national health insurance society under the national insurance act, thus reducing the cost of administration and giving a more personal supervision of the insured worker. This allows more benefit to be paid per head. Such a society is not a trade union and its funds cannot be used for such purposes as a trade union's would be. It is controlled by its members, the insured workers, who elect a committee and officers. The employer has no control of such a society, but most broad-minded employers grant office space for its administration in their works. These types of insurance societies are termed "Employees' Approved Societies." They are, of course, subject to a government audit at periodical intervals.

The outline of these systems of dental treatment would perhaps be incomplete if it were not mentioned that there is in Great Britain, still the usual clinic attached to our large voluntarily supported hospitals to which those unfortunate enough not to be included in the foregoing can apply for dental treatment. They must, if applying for such treatment, bring a "hospital note," signed by a hospital subscriber or donor. These clinics are generally attached to the dental schools and the work carried out by dental students under supervision. Formerly, treatment was free, but now a slight charge is made in most cases.

LETTER TO SCHOOL NURSES

The Bureau of Mouth Hygiene and Preventive Dentistry of the Michigan Department of Health recently issued the following letter to school nurses to stimulate their interest and encourage them in carrying on dental health work:

TO NURSES STARTING DENTAL PROGRAM:

Enclosed we are sending copies of material which we believe will help you in improving dental conditions in your vicinity, and some suggestions for using these.

We advise you first to talk over your plan with local dentist, or dentists, and try to secure his interest and cooperation. Make appointment with dentist for this purpose *outside of office hours*. Give him copies of these colored leaflets if he does not have them.* A large number of dentists have asked us for these to keep on waiting room table or send out with statements.

Many dentists, where there is no dental clinic, are willing to give the nurse an hour sometime during the week for indigent children, but the nurse must be sure these cases are worthy. Make the appointment and *see that the children are at his office on time.* It is a good plan to take them yourself and not depend upon someone else. If necessary to give gas and parent does not go with child, you must have written consent of parent. Get dentist's interest first in helping you work for a demonstration of the value of healthy mouths in *some one room especially.*

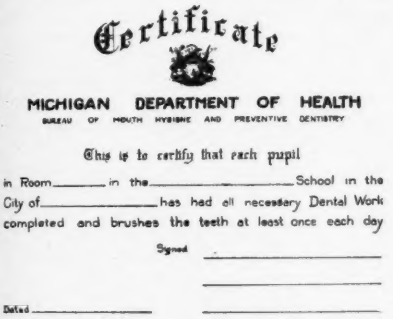
You can help the dentist in your contact with parents by urging the value and economy of children's dental work and that the parent should be willing to pay for this service on same basis as other dental service. This is not "plugging for the dentist." It means more money to the dentists to let these things go, but it means more health and money to the patient to take care of them early.

Get teachers interested by showing them bad mouth conditions, educational pamphlets, and telling them your plans. You can use the Dental Honor Roll leading to Certificate in any room, but select some one room where conditions are bad and cooperation most favorable to make a demonstration. Try to get this room completed and keep record of attendance and scholarship "Before and After."

*"Dental Hints for the Prospective Mother;" "Baby Teeth Should Not Be Neglected—Why?" and, "The Child's Permanent Teeth."

Also try to have a few examples of individual children where there was much mouth infection, child not well, out of school a great deal, etc., and then the dentist extracted all these abscessed teeth, filled others and put the mouth in a clean, healthy condition. Get record of a few such children "Before and After."

You can use examination card for dental examinations in school if you make any, but



Certificate

MICHIGAN DEPARTMENT OF HEALTH

BUREAU OF MOUTH HYGIENE AND PREVENTIVE DENTISTRY

This is to certify that each pupil

in Room_____ in the_____ School in the City of_____ has had all necessary Dental Work completed and brushes the teeth at least once each day

Signed _____

Dated _____

Dental Honor Roll

School_____ Room_____ Teacher_____

MICHIGAN DEPARTMENT OF HEALTH

BUREAU OF MOUTH HYGIENE AND PREVENTIVE DENTISTRY

to be put on Dental Honor Roll each child *must be examined by dentist with mouth mirror and explorer*, and bring statement signed by the dentist as found on card. Get up some competition as to who is going to be next on the Dental Honor Roll. Try to have some reward for first room to get a Certificate. If school authorities are willing to promise a half holiday, it will be more than made up in better attendance and scholarship.

A completed room one year must go through the same process the next year, but, of course, it will be much easier.

The Michigan Department of Health will furnish you free of charge in Michigan as many copies of these supplies as you can use judiciously. Be sure to let us know just the number you wish of each kind. Do not order more than you can use. We will be glad to furnish you additional supplies as needed. Where educational pamphlets or cards are sent home with child they should be put in an envelope.

The state director will also be glad to arrange to help you personally as far as it is possible by making a dental survey of certain school rooms, speaking before parent-teacher or other local organizations, and conferences or clinic with local dentists on children's dentistry. These should be grouped together so as much as possible can be done on one trip.

Do not be discouraged because the problem is so large. Concentrate on making a showing in some one place. This may take some home calls and dental calls, but we know this plan is practical because we have seen it tried in several places. Such a demonstration will show the need and sow the seed for a larger program.

Tell us your difficulties and let us help you, if possible. Do not forget to report your progress and success as this will help others.

Very truly yours,
(Signed) WM. R. DAVIS, D.D.S., *Director*,
Bureau of Mouth Hygiene and Preventive Dentistry.

CIRCULARS ON DENTAL HYGIENE SENT OUT BY NEW YORK BOARD OF EDUCATION

The following circulars have been issued by the Board of Education of the City of New York to the district superintendents and principals of schools and to the dental profession of the city:

BOARD OF EDUCATION
THE CITY OF NEW YORK
OFFICE OF
THE DIRECTOR OF PHYSICAL TRAINING
157 East 67th Street

To the Members of the Dental Profession of the City of New York.

Gentlemen:

The Board of Education of New York City is anxious to continue its efforts to es-

tablish in school children the habit of making an annual visit to a dentist for the purpose of prophylactic surface cleaning and repair work.

To this end, we have sent a letter of instruction, as set forth in the enclosed circular, to the principals of every elementary and junior high school in the City.

We know you recognize the great importance of the health habit of an annual visit to a dentist, and that you will continue to cooperate whole-heartedly with us, by supplying the necessary prophylactic and reparative treatment—by giving instruction in the use of the toothbrush and in the care of the mouth and teeth.

The affixing of your signature to the "Dentist's Certificate," is a very important step in this plan, and will testify that the pupil is under your care.

This plan has received the endorsement of the Oral Hygiene Committee of Greater New York, and of the Department of Health.

Very truly,

(Signed) A. P. WAY, M.D.,
Acting Director of Physical Training.

Approved:

(Signed) WILLIAM J. O'SHEA,
Superintendent of Schools.

GENERAL CIRCULAR NO. 15, 1926-27.

ITEM VII. *Establishing the Health Habit of an Annual Visit to a Dentist.*

To the District Superintendents and Principals.

Ladies and Gentlemen:

One of the most important health habits that teachers can help to establish in their pupils is the habit of making an annual visit to a dentist for the purpose of prophylactic surface cleaning and repair work. To this end, will you please instruct your teachers to encourage their pupils to make this visit to the dentist, either to the family dentist, or to a dentist in a clinic, as early as possible, so that the cleaning and reparative work may be accomplished before the end of the term. Children are to be encouraged to return to their teachers certificates, signed by the dentist, stating that the pupil is under dental care.

Through the Dental Journals and Bulletins, the dental profession of the City of New York will be notified by the Oral Hygiene Committee of Greater New York of this effort on the part of the Board of Education to "Establish the Health Habit of an Annual Visit to a Dentist." Only those children should be sent to a dental dispensary who cannot afford to consult their family dentist.

A sample form of the "Dentist's Certificate" is given herewith. May I suggest that you mimeograph, as you have done previously, a supply adequate for the pupils in your school.

The class which shows the largest percentage of certificates returned bearing the dentist's signature might be especially commended.

BOARD OF EDUCATION—THE CITY OF NEW YORK

P. S. ..... BOROUGH ..... CLASS .....

DATE .....

To the Parents of .....

Every person should consult a dentist at least once a year to insure preservation of his teeth.

Will you please take your child to a dentist for advice in dental hygiene, and treatment if necessary.

(Signed) .....
Principal

.....

DENTIST'S CERTIFICATE
For the
BOARD OF EDUCATION—THE CITY OF NEW YORK

Date .....

To the Principal of P. S. .....

BOROUGH .....

This is to certify that .....

class ..... is under my dental care, which is to include surface cleaning and reparative work if necessary. He has received instruction in the use of the toothbrush, and in the care of the mouth and teeth.

..... D.D.S.

Address .....

KENTUCKY'S ACTIVITIES IN ORAL HYGIENE

The Kentucky State Oral Hygiene Committee launched its campaign last September, with this slogan, "An Ounce of Prevention Is Worth a Pound of Promises," and in fifty-six towns in our nine districts we have already begun with dental education.

Our first procedure was free examination of all school children, with a free dental clinic held weekly for children unable financially to pay for the work they needed. Each dentist gives one-half day once a week in rotation, and donates all materials that he uses that day. This works a hardship on no one for either time or material.

We followed up our examinations with a series of eight educational articles in pamphlet form. These were placed in the hands of every school child after thorough explanation by the teacher.

For arousing interest, we have had lectures accompanied with moving pictures that have an appeal in an interesting story theme and educational value. They are used in schools, in cities and counties, and also periodically in theaters. They are all given without charge to the public.

Although our work up to this time has been started in only fifty-six towns, we have working chairmen in every district that are making every effort to push the work into towns and villages in every county. We have had cooperation everywhere that we have been, and the population at large are not only ready but also eager for prevention measures.

As chairman of this state committee, I urge every state to begin to teach preventive dentistry. The world is ready for it, why not give it what it wants?

Yours for prevention,

R. P. KEENE, *Chairman*
Kentucky State Oral Hygiene Committee

BRINGING DENTISTS TO CHILDREN IN WISCONSIN

Because conditions in rural parts of northern Wisconsin are such that it is impossible to bring the school children to a dentist, a dental clinic is being brought to the children. After two years of routine inspection and examination, the county nurse found no improvement in the children's health, declares Ann B. Christman in *Hygeia* for February. With the dental wagon it is now possible to give each child a dental mark of 100 per cent.

The wagon was built and equipped at a cost of $250, collected by means of a tag day. It is a one-room house, 6 by 8 by 6½ feet, made of fir ceiling strips to insure lightness of weight. There are five windows and a door with a step-ladder to the ground. It is mounted on the chassis of an old Ford automobile and pulled by the nurse's car.

A recently graduated dentist was engaged at $50 a week. The work is done at moderate cost, just enough being charged to cover running expenses.

Medical and Dental News

California

State Association Meets: The California State Dental Association met, January 24-27, in San Francisco. Preventive dentistry was the central theme of the meeting and J. Sim Wallace, of King's College Hospital, London, was the principal speaker.

Georgia

Second District Dental Society Meets: The regular quarterly meeting of the Second District Dental Society was held in Albany, January 26, with an afternoon of clinics, and a banquet and evening session at which Martin Dewey, New York City, spoke on orthodontia. Harry A. Holder, of Nashville, Tenn., also presented a paper.

Dr. H. Herbert Johnson Honored: The Sixth District Dental Society of Georgia honored Dr. H. Herbert Johnson of Macon with a testimonial banquet, December 7, in recognition of his pioneer work in the interests of dentistry. Members of the society from all parts of the state attended. R. Holmes Mason was toastmaster and Drs. Huff, Forbes and Hill, of Atlanta, and Green, of Milledgeville, spoke on Dr. Johnson as writer, teacher, dentist and citizen. Sheppard W. Foster, of Atlanta, made the principal address of the evening, his subject being "Dr. Johnson as a Friend." W. B. Childs, of Macon, presented a series of slides showing Dr. Johnson's activities since childhood. A watch and chain were presented to Dr. Johnson at the close of the evening.

Illinois

Joint Medical-Dental Meeting at Midwinter Clinic: Of outstanding interest in a meeting characterized by the unusual interest manifested in the various phases of its program was the joint meeting of the Chicago Medical and Chicago Dental societies, held on the evening of the first day of the sixty-third annual Midwinter Clinic of the Chicago Dental Society. The principal address of the evening was presented by Hugh S. Cumming, Surgeon General, United States Public Health Service, on "The Community's Responsibility for Health Education." Thomas L. Gilmer (M.D.), of Chicago, followed, with a paper on "Some of the Diseases of the Soft Tissues of the Mouth, Differentiating Between Those of Primary and Those of Secondary Origin," which was discussed by William Allen Pusey (M.D.), Chicago.

Dr. Sharp Retires: S. J. Sharp, a practitioner of dentistry for fifty years in Kewanee, retired from active practice recently, at the age of 79. Dr. Sharp educated five of his brothers in dental surgery: R. W. Sharp, Bradford, J. W. Sharp, Toulon, and W. Vance Sharp, of Stromsberg, Nebr., and Baxter and Andrews Sharp, now dead, who practiced in Mendota.

Pioneer Dentist Heads G. A. R. Post: Charles T. Barnes, aged 78, a veteran of the Civil War, and a practicing dentist in Chicago from 1875 to 1924, was made commander of the Old Glory Post G. A. R., Chicago, for the third time, January 9. He enlisted in the army as a drummer boy in 1861 and was honorably discharged from service in July, 1865. He returned to his home in Philadelphia and began the study of dentistry under a preceptor. In 1875, he entered Rush Medical College, Chicago, later transferring to Hahnemann Medical College, from which he was graduated in 1879. Dr. Barnes was a member of the Fourth Presbyterian Church choir for ten years. He was present at the laying of the corner stone of Rush Medical College in 1876 and present when the stone was opened in 1926.

Dr. Black's Original Office Acquired by Northwestern University: Northwestern University has acquired the original dental office of the late G. V. Black, which contains the cord driven, foot propelled dental engine invented by Dr. Black. The office fittings were recently moved from his old office in Jacksonville, Ill., to the tenth floor of the Ward Memorial Building on the McKinlock campus.

IOWA

Appointed House Dentist for Hospital: R. E. Walters, Rockwell City, has been appointed house dentist at the Polyclinic Hospital, Des Moines.

Korea Dental Health Center: This movement was endorsed by the American Association of Dental Schools at its meeting, January, 1927. The Odontological Society of Western Pennsylvania, and the Beaver Valley Dental Society both endorsed it and guaranteed an amount equal to 100 per cent of their membership at $10 each. John L. Boots, dentist, of Seoul, Korea, now in Chicago, who is in charge of the campaign for funds, has announced a gift of $1,000.00, for campaign expenses, so that all contributions may be added directly to the fund.

LOUISIANA

Dr. Kells Honored: C. Edmund Kells, best known for his pioneer work with the roentgen ray, was honored by the leading members of the dental profession throughout the South, who met in New Orleans, January 19, to witness the dedication of the C. Edmund Kells Memorial Library and Museum of Tulane University. The work of Dr. Kells has already been commemorated in Chicago, the Odontographic Society of that city having given Dr. Kells a banquet recently on his seventieth birthday. He was also summoned to New York recently to receive from the state dental society the Jarvie Fellowship Medal in dentistry, one of the highest honors in the gift of the profession.

MARYLAND

Midwinter Clinic of Baltimore Society: The second annual midwinter clinic of the Baltimore City Dental Society was held at the Hotel Belvidere, February 4-5. Membership in the clinic is limited to 200 members and these in turn are assigned to one of four classes, each class consisting of fifty men. Each class has the opportunity of attending all clinics in rotation during the two days' session. The clinicians were C. O. Simpson, St. Louis, whose subject was "Oral Radiography, Technic and Interpretation;" Chalmers J. Lyons, Ann Arbor, who presented a surgical operative clinic, including root resection, impactions and alveolotomy. H. B. Johnson, Atlanta, whose subject was "Root Canal Technic, Opening and Filling Small and Crooked Canals; Electrolytic Medication;" and J. K. Burgess, New York City, whose subject was "Fixed Oral Restorations, Anterior and Posterior Attachments for Vital Teeth; Pontics; Flexible Joints."

NEW YORK

Hospital-Hotel Completes Plans: The group of about 150 physicians and business men in New York who for three years have been planning for a $4,000,000 hospital-hotel have completed their plans. The hospital will cover a block on East End Avenue between Eighty-Seventh and Eighty-Eighth streets, overlooking the East River, will have about 400 rooms and will be designed to provide medical, surgical and research facilities, and accommodations for relatives and friends of the patients. There will be practically no free accommodations, but in many instances the expense to patients will be less than in hospitals which use their income to pay the expense of charity wards. The president is Guion H. Fountain, formerly with the National City Bank, and the executive officers of the medical board are Drs. Alexander Lambert, James A. Miller and Joseph S. Wheelwright. The management will be vested in a board of directors to be elected by a board of control. Other physicians on the organization committee are Drs. Albert R. Lamb, George D. Stewart and Shepard Krech.—*J.A.M.A.*, Jan. 15, 1927.

OHIO

Dr. Glenn Heads Clinic: George C. Glenn, of Urbana, has taken charge of the dental clinic of the Fraternal Order of Eagles, Springfield, and will devote his entire time to the work of this clinic and that of the clinic which he inaugurated at the Ohio Pythian Home last year.

PENNSYLVANIA

Odontological Society Meets: The Odontological Society of Western Pennsylvania met, February 11, with J. Sim Wallace, London, England, as the principal essayist.

Dr. Wallace spoke on preventive dentistry, a subject that has engaged his attention for twenty-five years. Recently, the Cartwright prize consisting of an honorarium and a medal, was awarded Dr. Wallace for a thesis on occlusion and the development of the jaw as affected by diet.

Sixth District Society Elects Officers: At the meeting of the Sixth District Dental Society of Western Pennsylvania, January 3, the following officers were elected: president, James M. Morgan, Homestead; vice president, E. S. Bracken, McKeesport, and secretary-treasurer, C. L. Hartman, Chambersburg.

Rhode Island

State Society Elects Officers: At the annual meeting of the Rhode Island State Dental Society, the following officers were elected: president, Ambrose H. Lynch, Providence; vice president, B. Cecil Burgess, Providence; secretary, Thomas S. MacKnight, Newport; treasurer, Philip A. Duffy, East Greenwich.

Dr. Gies Honored: At the close of the annual meeting of the Rhode Island State Dental Society, January 13, at the annual dinner, William J. Gies, professor of biologic chemistry at Columbia University, was presented with the award and medal of the society for 1927, in recognition of his services in the fields of education, science and journalism. C. J. Smith, president of the state society, acted as toastmaster, and presented the award. The report of the committee on award was made by James F. Clark, Pawtucket. Henry L. Banzhaf, Milwaukee, President of the American Dental Association, spoke on "The American Dental Association;" Frank P. Duffy, chairman of the state advisory committee, made a report on the Seventh International Dental Congress, and Tehyi Heieh, of Boston, spoke on "An Easterner Facing the West." In accepting the award, Dr. Gies, took for his subject "Looking Forward in Dentistry."

State Society Meets: The annual meeting of the Rhode Island State Dental Society was held in Providence, January 12-13. At the first sessions, Raymond L. Webster, of Providence, spoke on "Some Fundamental Relationships Between Orthodontia and General Dentistry; J. F. Barton, of Hartford, Conn., on "Dental Economics," and Mark Tishler, of Newport, on "Drill Technic for the Removal of Fractured Teeth and Embedded Roots." Thursday morning was given up to clinics by the Harvard Amalgam Club (Drs. Godfrey, Irvine, Severy, Tingley and Towle), Hubert Korhman, Danbury, Conn., Perley H. Roberts, Rochester, N. H., Blake Sears, Hartford, Conn., Fred R. Blumenthal, Boston, Fred W. Allen, and George A. Staples, Boston. The afternoon was taken up with a symposium on dentistry for children, by Frank A. Delabarre and Edward F. Sullivan, Boston, an address on "Enamel Tissues, Their Development, Form and Diagnosis, by Charles F. Bödecker, New York City, and a study course session by Benjamin Spector, Boston, on "Shock and Artificial Resuscitation."

Texas

New Medical Arts Building: The new Medical Arts Building at Houston has been completed and is rapidly filling up with members of the medical and dental professions, from the Harris County Medical and Houston Dental societies. With the exception of a supply house, all the occupants will be from the medical professions.

Virginia

Memorial Service for Dr. Brodnax: Memorial exercises were held at the Medical College of Virginia, Richmond, January 7, for John W. Brodnax, anatomist and artist, a member of the department of anatomy of the college for thirty-three years, who died last October. Addresses were made by W. Lowndes Peple, Robert C. Bryan, H. L. Osterud, W. F. Rudd, dean, and Mr. Rufus Alley.

New Buildings for Medical College: A twenty-year building program has been authorized for the Medical College of Virginia, the construction of three buildings, a women's dormitory, a clinic for ambulant patients and a laboratory of chemistry, bacteriology and pathology, being planned for the immediate future.

West Virginia

Wheeling District Society Meets: The Wheeling District Dental Society met, in semi-annual session, January 14. James R. Cameron, of Philadelphia, conducted an oral surgical clinic at the Ohio Valley General Hospital, and also read a paper after the evening banquet, on "Oral Surgical Cases of Interest to the Practitioner." W. L. Hoge was elected president for the ensuing year,

W. R. Loper, vice president, and W. E. H. Caldwell, secretary-treasurer.

Appointed to Board of Examiners: C. M. Jividen, of Charleston, and Homer Mannon, Huntington, have been appointed to the board of dental examiners.

Wisconsin

Dr. Banzhaf Recipient of Gift from Faculty: Henry L. Banzhaf was recently presented with a sharkskin traveling bag by the members of the faculty of Marquette Dental School in recognition of his election to the presidency of the American Dental Association.

Foreign

Health Insurance Act in Japan: Beginning January 1, any laborer in Japan may consult any medical or dental practitioner he chooses at the smallest possible cost, under the Health Insurance Act. With a population of 60,521,600, Japan has 55,611 physicians and 12,866 dentists. Pharmacists also come under the act. Any group numbering more than 300 may form an insurance association, insuring each worker belonging to the association. In other cases, the government is the insurer.

General

Rheumatism Serum: It is reported that a hitherto unknown organism has been isolated from the blood of rheumatic patients and the discoverer, James C. Small, of the Philadelphia General Hospital, has developed a serum that has cured a few cases of rheumatism. The work is still in the experimental stage, and those carrying on the research state that its value cannot be determined from the results in the limited number of cases treated.

Conference of State Society Officers: At the call of Otto U. King, General Secretary of the American Dental Association, the officers of the various state societies met in conference with the officers of the Association in the central office, January 25. After the roll call of states, Henry L. Banzhaf, President of the Association, addressed the group, numbering seventy-four and representing twenty-six states, together with a number of the Trustees of the Association and three members of the American Dental Trade Association, on "The Activities of the American Dental Association." Dr. King followed, with a paper on "The Value of the Service of the Association to Our Membership," and C. N. Johnson, Editor of THE JOURNAL, spoke on "Editing The Journal of the American Dental Association." A symposium on the exhibit problem was presented by R. M. Kerr, president of the Detroit Dental Manufacturing Company, Drs. Neuenschwander, Fort Wayne, Ind., Huegel, Madison, Wis., and Butler, Syracuse, N. Y., and W. C. Smith, manager of the sales department of the L. D. Caulk Company, Miford, Del. Adjournment was made to the Drake Hotel, where luncheon was served, and a general discussion of the exhibit problem was continued. The program was continued at the hotel with papers and discussions on "The Ideal State Society Program," by W. F. Whalen, Peoria, Ill., C. Walsh Hoffer, Nashville, Tenn., and George B. Winter, St. Louis, Mo.; "Extent to Which Entertainment Should be Provided and How to Finance It," by W. N. Hodgkin, Warrenton, Va., and George Bledsoe, Cullman, Ala.; "Solving the Membership Delinquency Problem," by H. E. King, Omaha, Nebr., and C. L. Byers, Indianapolis, Ind.; "Planning and Organizing a State Dental Health Program," by W. R. Davis, Lansing, Mich., Harold S. Smith, Chicago and Evelyn C. Schmidt, Chicago; "Advantages and Purposes of a State Society Bulletin," by Albert E. Converse, Springfield, Ill., and A. R. McDowell, San Francisco, Calif.; "Perfecting Plans for a Statewide Membership Drive," by George A. Stratton, Oshkosh, Wis., J. W. Gentilly, Cleveland, Ohio, and W. F. Walz, Lexington, Ky., and "Building Attendance for a State Society Meeting," by J. B. Carr, Indianapolis, Ind., G. A. Mitchell, Atlanta, Ga., Roy H. Ellis, Okmulgee, Okla., and Lewis E. Ford, Los Angeles, Calif. A banquet at the Drake, at which, as at the luncheon, those in attendance were the guests of the American Dental Association, was followed by a talk by Dr. Banzhaf on "Our Goal for 1927—42,000 Members," and a roundtable conference conducted by Dr. King.

Army

Dental Corps: Major O. P. Snyder assigned Walter Reed General Hospital, effective upon completion foreign service; previous orders revoked.—*Army & Navy Register*, Jan. 8, 1927.

The following relieved assignment and duty as indicated after name, ordered Hawaiian Dept., sailing May 18:

Captain O. J. Christiansen, Fort Hayes.

Capt. J. J. Weeks, Fort Oglethorpe.

Capt. J. L. Olsen, Fort Benning.

The following assigned as indicated after name upon completion of foreign service:

Capt. B. L. Smith, to Fort Douglas.

Capt. M. A. Sunderson, to Fort Bliss.

Capt. A. E. Anthony, to Fort Clark.

Capt. G. M. Krough, to Camp Stephen D. Little.

Capt. Albert Fields, to Fort Thomas.

Capt. R. R. Newman relieved Fort Douglas, ordered Philippines, sailing from San Francisco June 10.

Capt. Arne Sorum relieved Fort Eustis, ordered Philippines, sailing from New York May 18.—*Army & Navy Register*, Jan. 22, 1927.

Deaths

Baker, Samuel S., Woodsville, N. Y.; died, January 8, from pneumonia, aged 46. Dr. Baker was a veteran of the Spanish-American War.

Barrows, David E., Olean, N. Y.; died suddenly of heart disease, January 3, at Mount Vernon, N. Y.; aged 71.

Bjoraker, Karl E., Minneapolis, Minn.; University of Minnesota, College of Dentistry, 1916; died, January 3. During the war, Dr. Bjoraker served as a dentist at Fort Oglethorpe, Ga. He is survived by a wife, son and daughter.

Blake, A. S., Wauseon, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1903; died, January 8, of pneumonia; aged 43.

Dobbins, Arthur H., Marlboro, Mass.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1909; died suddenly, January 4, aged 45.

Elliott, William L., Attleboro, Mass.; died, January 5; aged 74.

Hanner, William S., Conway, Ark.; Vanderbilt University, School of Dentistry, 1895; died, January 11; aged 57.

Heizer, Edgar E., Pawtucket, R. I.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1897; died, January 7, of pneumonia.

Hoffer, F. C., Lorain, Ohio; Northwestern University Dental School, 1903; died, January 21, after a week's illness with intestinal influenza; aged 47.

Horton, Frank C., Clyde N. Y.; University of Buffalo, School of Dentistry, 1901; died, January 12; aged 51.

Hotaling, Harry A., Hartford, Conn.; Baltimore Medical College, Dental Department, 1907; died, September 13; aged 40.

Jensen, Helbeck, Atlanta, Ga.; Atlanta Dental College, 1906; died, January 21; aged 53.

Merrill, A. P., San Diego, Calif., died last September.

Miller, Frank P., Utica, N. Y.; Temple University, School of Dentistry, 1891; died, after a brief illness, January 5; aged 56.

Myers, Charles G., Cleveland, Ohio; Baltimore College of Dental Surgery, 1888; died, October 4; aged 61.

McDermott, Thomas H., Rochester, N. Y.; January 17, after a long illness; aged 54.

Pruyn, Walter Mann, Chicago, Ill.; Northwestern University Dental School, 1911; died, January 3.

Reynolds, George F., Chicago, Ill.; Northwestern University Dental School, 1906; died, October 5.

Schneider, J. J., Rochester, N. Y.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1924; aged 25.

Spurgin, A. Maurice, Dallas, Texas; died recently.

Swinehart, Edwin F., Versailles, Ohio; University of Michigan, College of Dentistry; died, January 19, after a short illness; aged 51.

Tobey, Robert E., Decatur, Ill.; died from a gun wound, self-inflicted, January 3; aged 65. It is believed that Dr. Tobey's health suffered impairment from a serious automobile accident which occurred some years ago.

Wallis, Charles Edward, L.D.S., M.R.C.S. Eng., L.R.C.P. Lond., London, England; died, January 4. Dr. Wallis was once associated with Lister, and at the Seventh International Dental Congress, presented a paper on his recollections of his distinguished colleague.

Watters, John T., Western Dental College, Kansas City, 1897; died, January 12.

Weaver, C. C., Dallas, Texas; died recently. Dr. Weaver was for years a member of the state board of dental examiners.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Usual Maxillary Deformations: The maxillary dental arch can be deformed in three directions, according to its three courses of growth, according to Harvey Stallard (*J.A.M.A.*, Dec. 18, 1926). It may be narrowed or widened disproportionately; shortened or elongated, and too high or too low in the face. Combinations of these faults produce the great variety of maxillary deformations. Most maxillary deformations begin after birth, the most grotesque starting at an early age, rarely after the twelfth or fifteenth year. The biologic casual factors may be classified as protoplastic and environmental. Heredity determines the quality of the protoplasm, but hereditary factors must cooperate with others to produce reactions capable of determining characters in functions and in forms. The chief influence that disturbed endocrines have on malocclusions generally is through their effect on the cellular reactivitives predisposing bones to deformations when subjected to natural or unnatural strains. Deficiency feeding may render bones unduly plastic or increase their original plasticity. Other unhygienic factors may also depress the reactivities of bone cells. Prenatal pressure sometimes modifies the shape of the jaws, but most children do not develop abnormality until the time of eruption of the teeth. Jaw deformations may result from perverted function: atmospheric and muscular forces derived from perverted respiration, mastication or deglutition. It is believed by some that lack of normal pressure may cause deformations. This is opposed to the view of Angle. That the malprotoplastic factors provide poor growth and the abnormal pressures misdirect it is the only explanation of malocclusion to coordinate all the known etiologic factors.

Dental Caries in the Wilds: Data obtained by examination of the teeth of Bantu children living in the Kraal villages of the Transvaal are presented by C. L. Leipoldt (*M. J. South Africa*, September, 1926; abstr. *Pub. Health*, December, 1926). Among 6,179 school children, 14.9 per cent had apparently sound teeth (boys, 12.6 per cent; girls, 20.3 per cent). Fully 45 per cent of these children were found to be physically defective in some degree, largely owing to malnutrition. Nearly all had been breast fed. Some had malaria, and septic adenoids, enlarged turbinates and septic tonsils, but no obvious rickets was found. It is concluded that there is no great difference in the incidence of caries in the European and aboriginal child except in the permanent dentition, in which the difference slightly favors the aboriginal. The author condemns the use of the toothbrush, favoring rather the use of silk thread and rinsing of the mouth.

Choice of Anesthetic: In selecting the anesthetic for the individual patient and operation, one is influenced by many considerations: age, sex, muscular development, condition of the heart, lungs, liver, kidneys, etc.; also the site of the operation, whether on brain, abdomen, etc. (William Webster, in *Cur. Res. Anes. & Anal.*, December, 1926.) The practice of using one anesthetic in a routine way belongs to a bygone time. While in concentrating on one anesthetic, the operator may become adept in its administration, the best ultimate result will be attained by intelligent selection and skilful use of the several tried and well known anesthetics. It is a fallacy to believe that those in good health, with good muscular development, are always the best risks for anesthesia, as the weaker, asthenic subject requires less of the anesthetic. The degree of confidence reposed in the anesthetist by the patient is of the utmost importance, tending to do away with the period of excitement and consequent struggling. In thyroid operations, the addition of a local anesthesia in nitrous oxid-oxygen anesthesia has not proved of advantage. Nitrous oxid-oxygen, the ether-oil colonic method, or

intratracheal insufflation, either by ether or chloroform, may be used. In upper abdominal surgery, when nitrous oxid-oxygen is used, it is usually necessary to use a certain amount of ether also, unless one is willing to carry the anesthesia to the point of secondary saturation. Ethylene gives greater relaxation than nitrous oxid but less than ether. Acetylene has been favorably spoken of by several authors. With this, or ethylene, it is sometimes advisable to commence with nitrous oxid because of the odor of the former. In empyema or in cases demanding drainage, nitrous oxid or ethyl chlorid is generally best. Old pulmonary cases stand anesthesia much better than recent ones. Nitrous oxid-oxygen alone, or with a little ether or ether-chloroform, may be used. Chloroform or an ether-chloroform mixture is better than ether, being less irritating to the respiratory passages. Contrary to common belief, the person with a weak circulation, with organic or functional circulatory derangement is a better risk than the patient having a vigorous vascular system, for the same reasons that those with less vigorous muscular development are better risks; i. e., relaxation is more prompt and deeper. It is best to avoid anesthesia during menstruation, as highly nervous patients may ascribe any untoward after-effects to the fact that the anesthetic was given at this time. Anesthetics can be given during pregnancy if care is taken that there is no restriction of air, causing muscular spasm. In diathermy, in treatment of malignancies of the face and mouth, nitrous oxid or chloroform should be used to obviate the danger of explosion. The breath-holding test is advocated as an index to the patient's suitability for operation.

Physical Condition of University Students: In an examination of 913 students at a state university (Rush and Ross, *Nation's Health*, December, 1926) Vincent's infection was found in eighty-one (the condition being endemic on the campus at that time); pyorrhea in forty-four, and caries and various dental defects in 773. The last figure was exceeded only in the number of nose and throat conditions (diseases and defects) found. Defects of vision ranked third in a comprehensive list of conditions for the presence of which tests were made. No student was found without some defect.

Vincent's Organism as Cause of Systemic Disease: Burns (*California & West. Med.*, September, 1926) contends that Vincent's organism may be responsible for many diseases of the body as a whole, such as anemia, dysenteric enteritis, dermatoses and pyorrhea. In smears made from cases (women), 80 per cent were positive for spirilla and fusiform bacilli. More than a thousand patients were recognized as suffering from the same infection, but the diagnoses were not confirmed by smear examination. Three patients with marked anemia, apparently secondary to some systemic infection, had dirty mouths, which proved to be heavily positive to Vincent's organism. They were all under the age of 35, and, in addition to anorexia and anemia, each represented a distinct type. One was "rheumatic," one was suspected of being tuberculous, although the sputum was repeatedly negative, while the other symptoms indicated disturbances of the gastro-intestinal tract. The roentgen-ray examination showed no root abscesses. The infecting organisms disappeared and all patients improved rapidly under spirocheticidal treatment.—Abstr. *J.A.M.A.*

Anesthesia: The Patient's Point of View: In viewing the future of anesthesia from the annals of the past, one realizes above all else the momentous changes due to scientific progress; but in this vision we must never for one moment forget that in this world of ours from the dawn of history one thing has remained in the very midst of its own wildest vagaries strangely immutable—human nature. For that reason the patient's point of view remains for the future as it is in the present, and has been in the past, a paramount consideration. Just as the anesthetists of each generation must be taught their work anew, so, too, the fathers and mothers, sisters and brothers of each generation must be reconvinced of the beneficence of the painless practice of medicine. When all is said and done, a successful profession, like a successful business, is based on the best possible service to the greatest number of people, and anesthesia will thrive in direct proportion to its satisfied "customers." Physicians themselves are extremely exigent as patients. Bearing this in mind, we can easily fathom the patient's point of view by putting ourselves in his place and doing by him as we would be done by. As anesthetists, our purposes, aspirations, and

vision are encompassed in the motto of the Pacific Coast Association: "It is godlike to relieve pain," and that of the Canadian Society, "We safeguard those who sleep."—Samuel Johnston, in *Cur. Res. Anes. & Anal.*, December, 1926.

Results of Treatment of Mouth Cancer: Simmons (*Surg. Gynec. & Obst.*, September, 1926) presents the results of a clinical analysis of 376 cases of mouth cancer. No new facts in etiology were brought out. Cancer of the buccal mucosa is a rapidly growing form of carcinoma, and is often incurable in a few months from the onset of the disease. In primary cases without clinical evidence of metastases, surgical treatment offers 35 per cent chances of permanent cure as against 15 per cent by irradiation. It offers no chance of permanent cure, and radical surgical treatment not over 5 per cent. The degree of malignancy varies somewhat as to the situation, cancer of the cheek and upper jaw being less malignant than cancer of the tongue or floor of the mouth. This is probably due to the fact that the papillary type is more common in the former positions. In the early cases, comparatively little reliance as to metastases can be placed on the presence or absence of palpable glands. Of the primary cases with death from a recurrence of the disease, life is prolonged by treatment, but the patient lives longer following operative treatment than following irradiation. In recurrent cases with death from the disease in all groups life is longer in the patients who were irradiated than in those receiving no treatment. A certain group of patients who may be said to have been "cured" by treatment are prone to develop a second cancer at some other point in the buccal mucosa. The results of treatment depend more on the amount of differentiation of the cells, as determined by the microscopic examination of the specimen, than on any other one factor.—Abstr. *J.A.M.A.*

Oral Sepsis and General Health: Laboratory investigators are more or less agreed that all devitalized teeth, whether treated or not, are infected; by that is understood that, on extraction, organisms can be grown from the root apex. The organisms are usually streptococci. From such evidence we are left to draw our own conclusions. The investigators seldom take the trouble to point out that, clinically, such evidence means little, for though at times certain strains of streptococci can be very virulent, in the majority of cases they are equally innocuous, and, further, they have no laboratory means of detecting one from the other. The fact that such organisms have probably come from the mouth, and are, in most cases, as Broderick has shown, identical with the particular strain in the mouth, raises the question as to whether the resistance to any particular organism is less in one site than another, for where the protective epitheljum covering the mucous membrane of the mouth is not intact, which is very seldom, the opportunities for invasion of tissue by a particular organism are almost the same, and I venture to suggest that, in health, mouth organisms are not particularly dangerous even at the apex of a tooth. The definite, scientific determination as to whether these organisms are pathogenic or not—that is, whether they are effecting body changes within that particular individual or not—is at present impossible. The ordinary bacteriological tests, such as the agglutination of the organisms suspected, by the patient's serum or by the sera of sensitised animals, so useful in certain specified diseases, like typhoid, fail us, for the streptococci do not give reactions with the patient's serum sufficiently definite to be of any use from a diagnostic point of view.—F. C. Wilkinson, in *Australian J. Dentistry*, Oct. 1, 1926.

Rheumatic Child: The rheumatic state in childhood, Thomson states (*J. State Med.*, October, 1926) is a condition which frequently exists without any clamant symptoms of ill health; nevertheless, it is dangerous, for it leads to serious diseases of the heart. As the result of rheumatism acquired in childhood, about 30,000 people die each year in this country from heart disease. Their deaths are preceded often by long periods of suffering and invalidity. Further, the rheumatic state deprives many children of the advantage of normal education. Two important factors in the production of the disease are poverty and damp. Until these factors are dealt with, rheumatism in children will probably continue. A great deal can be done to mitigate the consequences of rheumatism if the diagnosis is made early, and suitable accommodation is provided for the patients.—Abstr. *J.A.M.A.*

Tuberculous Ulcer of Lip: In 1919, Shie's patient developed the first lesions of lupus vulgaris. (*Ohio State M. J.*, October, 1926). The lesions gradually spread over his nose and a portion of both cheeks, and affected also a small area on the left breast. Under treatment, the lesions healed in about two years' time. In 1922, a somewhat similar lesion appeared on the cutaneous surface of the lower lip. About one month later, he noticed a hard nodule on the inner surface of the lip, and the lesion itself began to take on an indolent appearance. In spite of roentgen-ray therapy, it slowly increased in size, and a diagnosis of epithelioma of the lip was made by his private physician and by physicians of the Veteran's Bureau who also examined him. He was sent to the Cleveland Marine Hospital for surgical treatment. A V-shaped piece of tissue was removed, including the ulcerated area, with a liberal margin of healthy tissue. The lip was brought together with interrupted plain catgut sutures with silk, to the skin and the mucocutaneous border. The histologic examination showed marked chronic inflammation with many typical miliary tubercules of the proliferative type, and no evidence of malignant growths. For more than a year, he was free from symptoms. The lupus then recurred over the cheeks and nose and invaded both nares. The disease progressed during 1924 in spite of active radium and roentgen-ray therapy, and caused extensive destruction of the intranasal structures with gross disfigurement of the face. During 1925, however, the conditions gradually came under control and at the present time there are no active lesions. At no time was there any recurrence of the lip lesion, and there has never been any evidence of pulmonary disease.—Abstr. *J.A.M.A.*

Eliminating Static to Avoid Accidents with Anesthetics: To prevent static sparks: (1) Neutralize differences of electrical potentials in one or two ways by: (a) grounding everybody and everything coming into contact with and including the patient before beginning the administration of a combustible anesthetic; or (b) contact the anesthetist, inhaler and the patient's face before turning the combustible anesthetic into the inhaler and maintain this contact throughout anesthesia. (2) Administer only nitrous oxid-oxygen in the presence of known sources of ignition such as cauteries, x-ray and fulguration apparatus and open fires.—E. I. McKesson, in *Am. J. Surg.*

Socialistic Medicine: This tendency toward the socializing of medicine is due primarily to the apathy and indifference of the medical profession to the needs of the people. We have ignored the opportunity offered to educate the people concerning health and how to care for it, and others have taken up the work that we should have done. We have neglected to show the people the difference between a highly educated and well trained medical man and the medical pretender or quack. We have shown little or no interest in public health matters, even when consulted, except during the rare times when a serious epidemic is threatening the people. We even have encouraged and aided lay persons to engage in uplift work in connection with the promotion of health, only to find that when once started the lay individuals and organizations divorce themselves from us and assume our prerogatives even to some phases of the practice of medicine. We have encouraged and even aided in the establishment of free clinics of fifty-seven or more varieties, and we have done much to further the idea that sickness is something that is going to be cared for, no matter what the financial status of the patient may be, and oftentimes without money and without price. We have encouraged hospitalization and expensive nursing in altogether too large a proportion of sick people who could neither afford such care nor needed it, and because we have encouraged these expensive tastes which people in moderate circumstances could not afford to gratify there is a growing demand for the furnishing of such attention wholly or in part at public expense. Where it all will end is not a matter of guess work, but is quite a certainty as to the ultimate result of creating socialistic, or perhaps we might call it communistic medicine, with all of the ills that go with such a system.—*J. Indiana M. A.*

Early Union of Premaxilla to Alveolar Borders in Bilateral Harelip and Cleft Palate: A boy, 5 years of age, had had an unsuccessful operation in early infancy for unilateral harelip and cleft palate. He was admitted to the Post-Graduate Hospital at 22 months of age, and it was apparent that no attempt had been made at the previous operation to approximate the alveolar border. There was flattened nasal ala on the left side with union of the lip only along the lower border. There was a cleft through the alveolar border, hard and soft palate. The alveolar border on the

right side of the cleft was displaced forward and outward and the left border was turned inward. The hard and soft palate were united at one operation, and the child was then placed in the care of Dr. Millard, who approximated the alveolar borders by orthodontia. The lip and alveolar border were operated on later and the defect between them was closed.—Harold S. Vaughn, in *Am. J. Surg.*

Mixed Tumors of the Jaws: Martinez' illustrations show that these tumors may grow to the size of the head of an adult but still can be successfully removed. This was the case in the woman and the two men whose cases are described. The tumors were a fibrochondroma or fibromyxoma, with or without sarcoma. He removed the entire jaw, and there has been no recurrence to date. In one case, the tumor had been twenty years in growing to its enormous size.—*Rev. Med.-Quir. de los Hosp.*, Bogata; abstr. *J.A.M.A.*

Price of a Cold: At a recent convention in Atlantic City, the cost of colds was drawn to the attention of the assemblage. The meeting was addressed by Dr. Beeman Douglas of New York City, who declared that there were 100,000,000 colds a year in these United States. He placed the cost at $1,500,000,000 from loss of work, or an average of three days each at $5.00 a day. Dr. Douglas also stated that dry air in homes during the winter is largely responsible for the number of colds. A person goes from the open air with its natural moistness into his home where the dry air makes the membranes of the nose crack and bacteria find lodgment, thereby causing a head cold.—*Boston M. & S. J.*

Tartar Gingivitis in Relation to Cancer: Before the Societe belge d'otorhinolaryngologie, Dr. Heyninx recently spoke on the concomitance of cancer of the respiratory and digestive tracts with alveolodental pyorrhea and gingivitis. There may be a relation of cause and effect between the two affections. Also, cancer of the tonsil may be secondary to a primary gum affection or the like. If the gum affection were of microbic origin, it might produce chronic irritation and result in hyperplasia of the mucosa which covers the tonsil. If neoplastic in origin, it would produce metastasis in the tonsil. Infected saliva might carry the virus into the throat and esophagus.—Belgian Letter, *J.A.M.A.*

Cooperation of Surgery and Orthodontia in Cleft Palate: A boy, now 6 years old, came to the Post-Graduate Hospital at 3½ years of age with a history of an unsuccessful operation for bilateral harelip and cleft palate. There were incomplete union of the lip with flattened nasal ala, a very wide palatal cleft, and complete absence of the premaxilla. It had either been removed at the previous operation or had sloughed away. In that condition the case was regarded as inoperable and the child was turned over to Dr. Joseph J. Mallard, the orthodontist. He reduced the cleft, so that I was able to close the palate by the usual method. There was still a large defect left from the absence of the premaxilla, and this was finally closed by two flaps from the under surface of the lip, one flap being turned to give a mucous membrane lining on the mouth side, and the other a mucous membrane on the nasal side.—Harold S. Vaughn, in *Am. J. Surg.*

Medical Aspect of Dental Caries in Children: It is much to be desired that parents as well as medical men should realize how much interference with the health of a child, may, and often does, result from dental caries; and this although there may never have been the slightest toothache. But the commonest evil from decayed teeth in children is disordered digestion, and digestive disorder in childhood mean far more interference with nutrition than it does in adult life, for in childhood nourishment is required not only for the maintenance of life but also for the building of new structure, and failure of digestion means failure of nourishment. Hence it comes about that wasting or malnutrition are of the commonest diseases of childhood, and this disorder may be, and often is, dependent upon caries of the teeth by preventing thorough mastication. It has been said that children are naturally food bolters, very often they are, but not always. The reason may be caries, and tenderness of teeth, and the result of swallowing food unchewed may be not only the cause of impairment of nutrition but also colicky pain in the abdomen. Failure of appetite is a common symptom of dyspepsia in childhood and one which causes no little anxiety to parents, and I think puzzles the medical man by its obstinacy. Of course there are many causes for loss of appetite in childhood, but dental caries must be seriously reckoned with as a definite cause.—Milton Smith Lewis, in *J. Tennessee Dent. Ass'n.*

Dental Economics: The practitioner of dentistry must realize that there are two problems to be solved before he achieves success. First, he must have the knowledge and the ability to serve the public. Second, he must have the ability to sell his knowledge to the public on terms profitable to both parties. Both of these problems are combined in every dental operation and should be well analyzed. First, ability to serve the public is fitness for the job. The man who was fit for the job yesterday may not be fit for today's work. And the man who is fit today will not be fit for tomorrow's unless he prepares himself and keeps up with the world's progress. Time was when a good artisan could be a good dentist, today he must be much more than an artisan, and the time is rapidly coming when a great deal more will be demanded of us or we will not be fit. Then let us each ask of ourselves, am I fit to have a good practice? Am I sufficiently learned in dentistry, medicine and general biology to qualify as a good dentist? Am I sufficiently trained in technic and finger skill to do properly what should be done? Am I gentle, and clean and considerate in inflicting pain? In short, am I honest in my pretensions to the public? The answer to these questions is the key to a good practice, any man who knows that he is qualified in all these matters will carry with him a dignity and self-confidence that all others will sense and accept. But what of the man who is honest with himself and realizes that he is deficient in one or more essentials? Can I confer with my medical friends understandingly and speak their language and terminology? If not, why not learn? Buy an up-to-the-minute volume on general medicine, and on general pathology, also a good medical dictionary. Take the journal of the American Medical Association, subscribe to the *Scientific Monthly*, or other good magazines. Can I take my place in the community as an educated cultured man? If not, why not learn? In these days of cheap books and fine libraries you can get history, literature, biography and books on all the social problems. Even if you live only on the cross roads, you can converse with the great minds of the present and past ages through books. Am I deficient in the technic of dentistry? There are local, state and national clinics, post-graduate courses, and study clubs. Most men are flattered when asked to show us something and respond gladly. Only fools ask no questions. Although I have practiced almost thirty years, I know I could learn some thing by a visit to the office of every man in this room, and so can each of you.—S. H. Voyles, in *Bull. Missouri State Dent. Assn.*

Prevention of Heart Disease: Emerson further enumerates the causes of 927 cases of cardiac disease in adults which were sufficiently carefully analyzed to permit of a sound opinion as to the probable causative infection: acute rheumatic fever, 331; acute tonsilitis, 207; syphilis, 122; scarlet fever, 78; diphtheria, 47; pertussis, 14; measles, 54; carious teeth, 163; chorea, 7. These figures were taken from the records in the Associated Cardiac Clinics in New York City. It was more difficult to sort out the causation in the case of children, because the records show all the infections, and in many instances several of them prior to the onset of the reported symptoms of heart disease, but in 720 cases in which it seemed best to place the probable etiological factor, the chief factors were given as follows: acute rheumatic fever (growing pains, etc.), 279; acute tonsillitis or sore throat, 282; syphilis, 0; scarlet fever, 53; diphtheria, 63; pertussis (at one clinic only), 130; measles, 232; carious teeth (none at one clinic), 202; chorea (none at two clinics), 49.—Alexander Lambert, in *Atlantic M.J.*

"Chillen What Is Chillen": Better than a bonus, or a gratuity, better than insurance or other financial stay, better than scientific or patriotic appeals, is the educational campaign quietly and steadily pursued throughout the country to help parents produce and rear children of the kind that everyone wants. If one doubts the need and the keen desire of parents for knowledge; if one questions the practical and permanent value of such instruction; if one wants proof of the efficacy of federal funds to supplement inadequate state appropriations, let him visit a children's health conference in any small community (where most of our children live) of any state in the country and talk with parents who patronize such activities.—Frances S. Bardley, in *Pub. Health Nurse.*

Announcements

CALENDAR OF MEETINGS*

NATIONAL SOCIETIES

American Dental Assistants Association, October 24, 1927, Detroit, Michigan.

American Dental Association, October 24-28, 1927, Detroit, Michigan.

American Society of Orthodontists, May 3-6, 1927, Chicago, Illinois.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June inclusive.

March (1927)

Louisiana, at New Orleans.
Montana, at Billings (24-26).
Pennsylvania, at Scranton (8-9). (Midwinter.)

April (1927)

Alabama, at Montgomery (12-14).
Connecticut, at New London (28-30).
Kansas, at Topeka (20-22).
Kentucky, at Louisville (5-7).
New Jersey, at Newark (27-30).
North Carolina, at Greensboro (11-13).
Oklahoma, at Oklahoma City (25-28).

May (1927)

Arkansas, at Hot Springs (9-11).
Illinois, at Peoria (10-12).
Indiana, at Indianapolis (16-19).
Iowa, at Des Moines (3-5).
Maryland, at Baltimore (2-4).
Massachusetts, at Boston (2-6).
Missouri, at St. Louis (23-26).
Nebraska, at Omaha (16-19).
New York, at Buffalo (18-20).
Pennsylvania, at Pittsburgh (10-13).
South Carolina, at Columbia (9-11).
South Dakota, at Sioux Falls (9-11).
Tennessee, at Memphis.
Texas, at Austin (10-13).
Vermont, at Burlington (25-27).
Virginia, at Virginia Beach (9-11).
West Virginia, at Martinsburg (16-18).

June (1927)

Colorado, at Colorado Springs (15-18).
Georgia, at Albany.
Maine, at Belgrade Lakes (21-23).
New Mexico, at Roswell.
Wyoming, at Thermopolis (20-21).

July (1927)

Porto Rico, at San Juan.
Wisconsin, at Milwaukee (12-14).

October (1927)

Florida, at St. Petersburg.

December (1927)

Ohio, at Cleveland (2-4).

*Announcements must be received by the ninth of the month in order to be published in the forthcoming issue of THE JOURNAL.

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

Massachusetts, at Boston, March 14-16, 1927. Secretary, W. Henry Grant.

Michigan, at Ann Arbor, June 13-18, 1927. Secretary, J. W. Lyons, 617-21 Dwight Building, Jackson, Michigan.

New Jersey, at Trenton, June 27-July 1, 1927. Secretary, John W. Forsyth, 148 W. State St., Trenton, New Jersey.

West Virginia, at Charleston, June 28, 1927. Secretary, C. H. Neill, 206 Professional Building, Fairmont, West Virginia.

ARKANSAS STATE DENTAL ASSOCIATION

The Arkansas State Dental Association will hold its annual meeting in the Arlington Hotel, Hot Springs, Monday-Wednesday, May 9-11, 1927.

H. J. CRUME, *Secretary*,
Wilson Bldg.,
El Dorado, Ark.

MISSOURI STATE DENTAL ASSOCIATION

The next meeting of the Missouri State Dental Association will be held at the Chase Hotel, St. Louis, May 23-26, 1927. E. H. Keys is the chairman of the program committee and George W. Winter is president of the association.

O. W. BRANDHORST, *Chairman*,
Publicity Committee,
225 Lister Bldg.,
St. Louis, Mo.

NEW JERSEY STATE DENTAL SOCIETY

The fifty-seventh annual meeting of the New Jersey State Dental Society will be held at the Robert Treat Hotel, Newark, April 27-30, 1927.

EDWARD L. WHARTON, *Chairman*,
Publicity Committee.

TEXAS STATE DENTAL SOCIETY

The forty-seventh annual convention of the Texas State Dental Society will be held at Austin, Tuesday-Friday, May 10-13, 1927. Headquarters will be at the Austin Hotel. A postgraduate course by expert clinicians has been provided as a special feature of the meeting.

J. G. FIFE, *Secretary*,
Dallas, Texas.

VERMONT STATE DENTAL SOCIETY

The fifty-first annual meeting of the Vermont State Dental Society will be held at Burlington, May 25-27, 1927.

LLOYD C. ROBINSON, *Secretary*,
Morrisville, Vt.

WYOMING STATE DENTAL SOCIETY

The Wyoming State Dental Society will meet, June 20-21, 1927, at Thermopolis.

E. C. ANDREW,
Cheyenne, Wyo.

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

The Massachusetts Board of Dental Examiners will hold an examination for registration for both dentists and oral hygienists in the City of Boston, March 14-16, 1927. Full information, application blanks, etc., may be secured at the office of the secretary, Room 146, State House, Boston. All applications must be filed at the office of the secretary at least ten days before the date set for the examination.

W. HENRY GRANT, *Secretary*.

MICHIGAN STATE BOARD OF DENTISTRY

The next examination by the Michigan State Board of Dentistry for the purpose of granting licenses to practice dentistry and oral hygiene in the State of Michigan will be held at Ann Arbor, June 13-18, 1927. Applications must be on file thirty days before examination. For further information and application blanks, address

J. W. LYONS, *Secretary*,
617-21 Dwight Bldg.,
Jackson, Mich.

NEW JERSEY STATE BOARD OF REGISTRATION AND EXAMINATION

The State Board of Registration and Examination in Dentistry of New Jersey will hold its regular examinations at Trenton, commencing June 27, 1927, and continuing for five days thereafter. The license fee is $25.00; reexamination fee, $10.00.

Practical tests required: Insertion of an approximal gold filling, with the approximating tooth in position, compound approximal amalgam filling and a silicate filling, the candidate to furnish his own patient. Taking of impression, bite, selection of teeth, articulation and trial plate, the

candidate to furnish his own patient. Practical examination in mouth diagnosis.

Attention is invited to the following quotation from the dental law of New Jersey: "Applicant shall present to said Board a certificate from the Commissioner of Education of this State, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved high school or the equivalent thereof."

In accordance with this law, the secretary will issue application blanks only on presentation of the required certificate from the Commissioner of Education, State House, Trenton.

Applications must be filed, complete, ten days before the date of examination.

Address all communications for further particulars to

JOHN C. FORSYTH, *Secretary*,
148 West State St.,
Trenton, N. J.

FIRST DISTRICT DENTAL SOCIETY

The First District Dental Society wishes to announce the establishment of their present office and also meeting rooms in the new Academy of Medicine, 2 East 103rd Street, Corner 5th Avenue, New York City.

We wish to invite all dentists who are visiting New York to make use of the facilities found at our office and the Academy of Medicine.

Here is housed one of the largest medical and dental libraries in this country, situated in the most beautiful surroundings. A visit to this building is well worth while as it is counted one of the show places of the metropolis.

A complete file of all dental activities will be kept, such as scheduled meetings, clinics and courses in and around New York, as well as information on all subjects relative to the study of dental science, both for undergraduates and postgraduates. Lists of approved courses to be given in schools, clinics and by individuals will be available.

Mail may be addressed, care of First District Dental Society, 2 East 103rd Street, New York City; telephone, Atwater 7424.

JOHN T. HANKS, *President*.

CONNECTICUT STATE DENTAL HYGIENISTS ASSOCIATION

The next meeting of the Connecticut State Dental Hygienists Association will be held in New London, April 28-30, 1927.

VIRGINIA CASE, *Secretary*,
13 Plainfield St.,
Hartford, Conn.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

The third annual session of the American Dental Assistants Association will be held in Detroit, Mich., during the week of October 24, 1927.

JULIETTE A. SOUTHARD, *President*,
MAUDE SHARPE, *General Secretary*,
Suite 1202, 8 West 40th St.,
New York City.

DENTAL HYGIENISTS ASSOCIATION OF THE STATE OF NEW YORK

The seventh annual meeting of the Dental Hygienists Association of the State of New York will be held at the Hotel Statler, Buffalo, N. Y., May 18-20, 1927. A cordial invitation is extended to dentists and dental hygienists to attend the clinics and literary meetings.

MARY A. OWEN, *Secretary*
28 Tremaine Ave.,
Kenmore, Buffalo, N. Y.

NEW YORK SOCIETY OF ORTHODONTISTS

The annual spring meeting of the New York Society of Orthodontists will be held, March 9, 1927, at the Vanderbilt Hotel, 34th St. and Park Ave., New York City. It has been planned that both practical and scientific material presented will be new and original.

CHARLES A. SPAHN, *Sec'y-Treas.*,
121 East 60th St.,
New York City.

SIXTH AUSTRALIAN DENTAL CONGRESS

The Sixth Australian Dental Congress will take place in the new anatomy school of the University of Melbourne, Aug. 22-27, 1927.

The Congress will be divided into sections, covering the various phases of dentistry. The discussions will embrace the full range of dental practice, and an extensive program of clinics will be staged. Visiting dentists from beyond Australia will receive a most cordial welcome. The president of the congress is W. J. Tuckfield, and the honorable secretary, George Finlay, 105 Collins St., Melbourne.

THE DENTAL SOCIETY OF WESTERN CANADA

The Dental Society of Western Canada (Alberta, Saskatchewan, Manitoba) will meet in Edmonton, Alberta, May 25-27, 1927.

LESLIE MCINTYRE,
Chairman of Publicity.

THE AMERICAN DENTAL SOCIETY OF EUROPE

The next meeting of the American Dental Society of Europe will be held in Paris, Aug. 1-3, 1927.

A PROCLAMATION

By the President of the United States of America.

During the World War the United States government insured, at an exceedingly low premium rate, nearly 5,000,000 members of the armed forces of the country against death or total permanent disability. The insurance thus granted was for the greater protection of the insured and their dependents than was afforded in the compensation, independently of insurance and unconnected therewith, which was provided for death or disability resulting from personal injury, or disease contracted in the military service.

Statutory provision was made for the continuance of this war risk insurance after the termination of the war, and its conversion within a limited time into such form or forms of insurance, usually issued by life insurance companies, as the insured might request. Many veterans do not seem to have had knowledge of this continuing privilege, and for one reason or another have permitted their war risk insurance to lapse. Under the terms provided for the reestablishment of lapsed insurance, normal health conditions will permit reinstatement upon the payment of two monthly premiums; and for those whose service disabilities render them otherwise not insurable, and who are not permanently and totally disabled, provision is made for reinstatement upon the payment of premiums and interest for the period of lapse. Even these payments may be temporarily waived for those whose resources do not permit immediate compliance.

The law provides that no reinstatement of war risk life insurance which has lapsed shall be made after July 2, 1927. After that date, such war risk term insurance cannot be reinstated. On or prior to that date, therefore, such insurance must be reinstated and converted, at the election of the applicant, into one or more of the seven standard forms of life insurance provided by the Government. If such insurance is now in force, the insured must convert it into one of the forms above mentioned on or before the above date.

The potential protective value of the insurance thus provided is apparent, as affecting the future economic and domestic welfare of veterans and their dependents. Provision is made for extended insurance, paid up values, loan values, cash surrender values, and dividend participations. No premium is charged during total permanent disability. Thousands of our national defenders are passing on each year. All veterans of the World War should be generally and fully informed of their right to procure the safe and certain protection for themselves and their dependents of the insurance afforded by the Government.

Detailed information with reference to such insurance may be obtained from the Central Office of the United States Veterans' Bureau, Washington, D. C., or from its Regional Offices located throughout the country.

Wherefore, I, Calvin Coolidge, President of the United States, do hereby designate the period January 31 to February 7, 1927, as a time during which special effort should be made to inform all veterans of the World War of the right they have to reinstate lapsed war risk life insurance, and to convert it into United States Government life insurance; and, that all such veterans may, in some manner, be properly informed, I urge all citizens, particularly employers, the press, labor organizations, women's associations, professional groups and civic and patriotic bodies, to secure full information and use

such means of informing the veterans as may be most effective.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done at the City of Washington, this eleventh day of January in the year of our Lord one thousand, nine hundred and twenty-seven, and of the Independence of the United States the one hundred and fifty-first.

(SEAL)

By the President: CALVIN COOLIDGE
FRANK B. KELLOGG,
Secretary of State

BOOK REVIEW

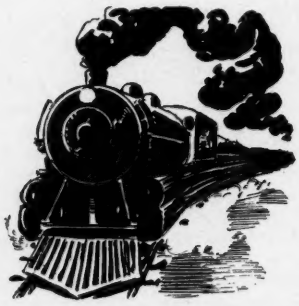
Variations in the Form of the Jaws, with Special Reference to Their Etiology and Their Relation to the Occlusion of the Dental Arches. By J. Sim Wallace, M.D., D.Sc., L.D.S. Lecturer on Preventive Dentistry King's College Hospital; late Dental Surgeon and Lecturer on Dental Surgery and Pathology, London Hospital, The Cartwright Prize Essay. 265 pages, with 84 illustrations. Price $6.00. Published by William Wood and Company, New York.

The author of this book has long been known as a careful investigator, particularly with reference to the effect of diet on the development of the teeth and jaws. In the present work he has said very little about diet, but has dealt more with the question of variations due to pressure and tension strains on the jaws, and to racial factors. One of the most interesting chapters is that on "Post-Natal Development of the Jaws," in which he shows by illustrations made from casts of one individual from 3½ up to 24 years, the gradual variations in development. It is a most impressive showing.

The author never takes up any line of study without going into it thoroughly, and the present volume is no exception. It will justify several readings, and it should be in the library of every progressive practitioner. One minor suggestion is hereby made that in future editions (of which we hope there will be many) the author should seriously consider a revision of the nomenclature. It cannot of course be hoped that there will be at once develop a unanimity of opinion concerning all the terms we use in dentistry; but it would seem that the day had passed when such terms as "wisdom teeth" should be used in a scientific work of this character. This is only one of a number of phrases which seem to us to need revision, but we hasten to say that this does not in any way detract from the value of the work to the student or the practitioner.

SPEED ALONG WITH THE TIMES

By Ernest V. Madison



A steel constructed, luxuriously furnished train darts Westward through mountains, across prairies, preceded by a chorus of clanging crossing-bells and leaving behind a snaky trail of smoke.

At the same time, a leather helmeted, begoggled man, seated in a contraption of wood veneer, aluminum, wires and demoniacal engines is whizzing Eastward across the Rockies, carrying the government air mail, at a speed greater than 100 miles an hour.

Simultaneously, a man in London takes down his telephone receiver and, within a few seconds, his words have traversed the Atlantic to a resident of New York.

We have to step fast nowadays. This is the age of speed—of quick action. And it is also the age of quick decisions.

As business men we must think quickly, and decide without delay on our problems of replacements, expansion, competition, service improvements and operating economies. Moreover, our thoughts and decisions must be surrounded by safety—the knowledge of exactly what to do; and, above all, of the concrete elements necessary to put action into our decision.

The advertising section of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION describes many products that will help us in the latter connection. It contains information about equipment, machines, methods, materials, etc., and this information is a mental requisite of the dentist.

These advertisements in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, therefore, should be read regularly. They add to our mental growth.